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The Oil Man's Calendar

JUNE 1-3	American Petroleum Institute, Mid-Year Meeting, Colorado Springs, Colorado.
5	San Joaquin Oil Men's Barbecue for California Oil Men, Bakersfield.
10-12	Pennsylvania Grade Crude Oil Association, Sailing from Buffalo, New York.
11	Interstate Oil Compact Commission, Santa Fe, New Mexico.
14-19	Second World Congress of Petroleum Paris, France.
17	National Stripper Well Association, Tulsa, Oklahoma.
20-26	Golden Celebration of Oil and Gas, Findlay, Ohio.
25-27	National Oil Scouts Association, Dallas, Texas.
JULY	Seventeenth International Geological Congress, Moscow, U.S.S.R.
12-13	Interstate Oil Compact Commission, Santa Fe, New Mexico.
AUG. 10-15	Third Michigan Oil & Gas Assn., Mt. Pleasant.
SEPT. 15-17	National Petroleum Association, Hotel Traymore, Atlantic City, New Jersey.
SEPT. 27 OCT. 1	American Gas Association, Cleveland, Ohio.
OCT. 11-16	Oil-World Exposition, Houston, Texas.
14-16	American Association of Petroleum Geologists, Mid-Year Meeting Pittsburgh, Pennsylvania.
14-16	Independent Petroleum Association of America, Houston, Texas.
29-30	Mid-Continent Oil and Gas Association, Texas Division, Dallas, Texas.
NOV. 9-12	American Petroleum Institute, (Annual), Chicago, Illinois.

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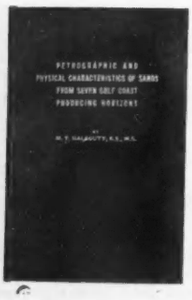
By M. T. Halbouty, B.S., M.S.,
Chief Geologist, Glenn H. McCarthy, Inc.



The material printed in this book was first published in The OIL WEEKLY in a number of installments, extending over a seven-week period. Because of the widespread interest and demand for copies, it is being presented in book form for the benefit of those who may wish to study or continue the research work of M. T. Halbouty, the author.

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LOOKING AHEAD

WITH THE EDITOR

Advancement in Drilling . . .
Abuse of Pipe . . .
Geophysical Methods . . .

ADVANCEMENTS in drilling and geophysical work will be the subject of our next issue. The entire feature section of the book is to be devoted to these topics.

Drilling engineering has made major progress in recent years, and steps forward will be covered in a comprehensive array of articles. The drilling of wells to 10,000 feet and deeper is becoming common during 1937, and the full history of such deep drilling will be presented.

There have been changes in ideas on rotation speeds and weight of bits, and an article on progress in this work will be published.

Another article will deal with rotary mud advancements, of which there have been many.

Control of high pressure has become more acute with deeper drilling. How the industry is tackling this problem will be told.

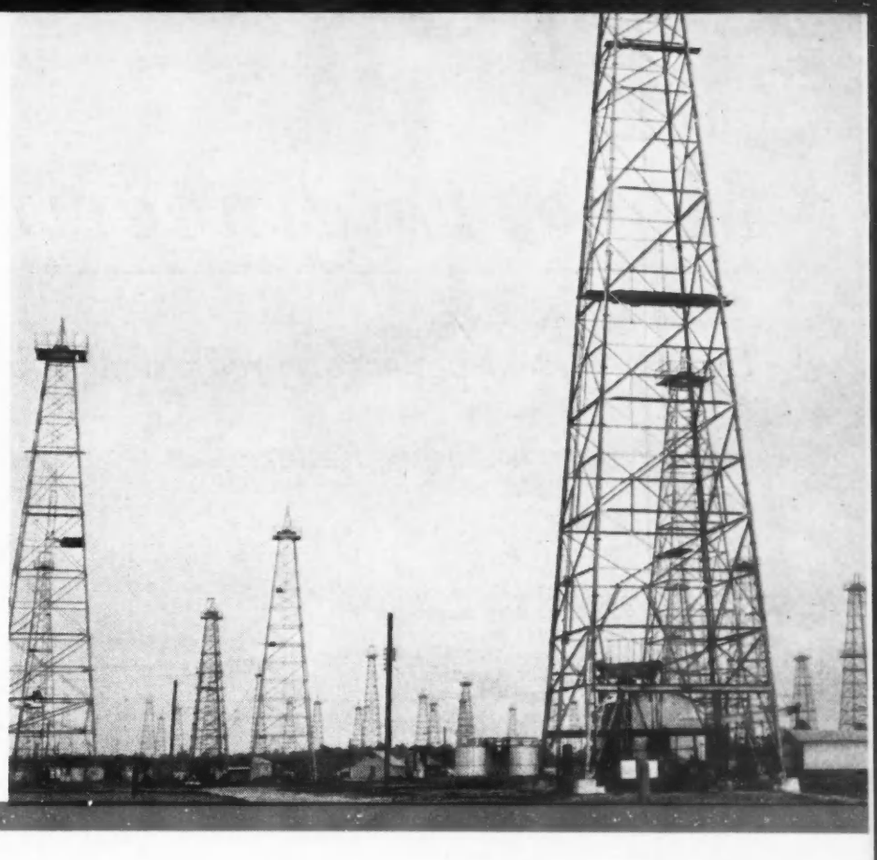
ABUSE of equipment in the industry is particularly fragrant in the drilling end, especially of tubular goods, which will be our "equipment care series" article for the number.

DURING the course of years the industry has depended on random drilling, surface geology, etc., for locating new fields. The newest trend is the employment of geophysical methods, which during the past 10 years has come to the foreground. An interesting article on discovery methods of the past 10 years is being prepared. The progress in geophysical studies will be another subject of another article.

With such a vast array of articles, the drilling and geophysical fields will be covered from an achievement standpoint. Many new ideas will be presented, and others correlated.

THIS WEEK

» THE HULL FIELD, Liberty County, Texas, reflects a form of civic pride not found in the average boom field along the Gulf Coast. The leases generally are well kept and the early rivalry for appearance still holds. The field at one time was regarded as a show place to prove that all oil fields do not completely ruin the landscape.



OPTIMISM that a flood does not dampen is in evidence this week in the oil industry. Big event was the gathering of engineers for the mid-year session of the American Petroleum Insitute at Colorado Springs. A well-rounded program for the advancement of production technique there was interrupted long enough for President Byles to talk about how the business is booming, and to warn that proration allowables must be taken seriously if the rosy outlook is to continue. **Page 10.**

MEANWHILE the authorities having to do with fixing the amount of oil to be produced have bolstered the good feeling engendered by the unprecedented demand getting started on the summer straight-away, by fixing allowables for June at levels calculated to halt the upward mounting stocks of crude oil. In fact, the pile-up of crude already has halted, but with plenty of oil in the tanks. **Page 15.**

STOCK traders continue to look with favor on the oil business. Higher dividends for the first part of the year and prospects that these earnings and disbursements will be continued give oil shares a stability that is little affected by the fluctuations of the general market. **Page 71.**

THE general market situation is favorably strong. Demand for gasoline already is diminishing stocks of that product—and while there are more gallons in the tanks than ever before, rate of consumption keeps the supply in line with last year — and last year's stocks proved not too big. Fuel oil is in for another good price season next fall, if one would look that far in the future. **Page 67.**

CURRENT SITUATION

(Latest Available Weekly Data)

Outlook. — Prospects of better crude control in June offer encouragement.

Crude Market.—Stricter allowables make for stronger tone.

Refined Oil Markets.—Improvement in prices believed likely.

Crude Production.—Down 33,400 barrels daily.

Crude Runs to Stills.—Down 45,000 barrels daily from all time peak.

Crude Stocks.—Down 394,000 barrels in week ended May 22; first decrease in 17 weeks.

Gasoline Stocks.—Down 329,000 barrels.

Gas and Fuel Oil Stocks.—Up 1,112,000 barrels.

Drilling.—Completions last week increased 96 to 672.

See* MARKET SECTION *for Details

OIL companies were mentioned specifically by the President and his Treasury Secretary in calling on Congress to pass legislation to stop depletion allowances on federal taxes. Demand that it be stopped was in words that would indicate that taxes are being avoided unscrupulously by observing the terms of the law. **Page 64.**

SUSTAINED production of 2500 barrels per day from Pure Oil Company's McCloskey sand well in Clay County, Illinois, is causing the Coal Basin area to get quite a leasing play, with independents taking the lead. The McCloskey is now regarded as a better bet than the Cypress sand of the Chester series of the Upper Mississippian which caused the current flurry in Illinois. **Page 92.**

POSSIBILITY of a new pool east of Winfield in Cowley County absorbed attention of Kansas operators this week, along with a showing made by a Derby Oil Company test in Graber pool indicating possibility of commercial production from the Misener sand in that field. **Page 76.**

CALIFORNIA has been a great record grabber. Almost every time a record on depth, or things of the sort, has been established somewhere else, California has let the record holder bask in glory a short time and then hopped in to take the record away. Last week it looked as though a Superior Oil Company test in Ten Section field, California, would grab off the world's record for depth. But the hole was junked at 12,618 feet this week, just 168 feet shy of the standing mark. **Page 91.**

More Engineering Progress

Experts present papers on production problems.

★ ★ ★

More research studies undertaken by engineers.

By WARREN L. BAKER
Editor

Colorado Springs, Colo.—That much progress has been made in technical and practical work by the production end of the industry, that many interesting research projects are now underway, which with additional studies may result in further improvements, was in evidence at the Division of Production sessions of the Mid-Year Meeting of the American Petroleum Institute held here last week. Problems related to the production of oil, estimation of reserves, proration of output, handling and use of tubular goods and drilling difficulties and practices were placed under scientific scrutiny as experts presented prepared papers and led round-robin discussions.

By study, research, experimentation and persistence, it was shown that the industry's technical men have overcome difficulties regarded only a few years ago as virtually insurmountable. Data presented to the industry at the meeting added much to previous knowledge and should lead the way to further progress. Not only were several of the newer engineering topics discussed, but some of the older ones. Discussion on such old subjects as frozen drill pipe, abuse of field equipment and pumping showed that new angles have been developed in these fields that should prove of assistance. New methods of attacking such problems were brought to light.

Four Sessions

The Division of Production held four sessions, the first of which was devoted to allocation and allied production problems. The second meeting discussed two important drilling problems and one production topic of interest. Oil country tubular goods, its abuse, use and proper manufacturing, was the subject at another meeting. The final meeting of the division dealt with pumping problems.

In addition to the four general sessions, there were numerous committee meetings held by the Division of Production. Many of these were devoted to standardization of equipment, and included the work of adding new standards to those existing and to the revising or drafting of others. The drilling of wells to deeper horizons has brought forth new problems, including greater stress and fatigue, control of higher pressures, which has necessitated the drafting of new and higher quality standards. The work at the meeting brought many new standards practically to conclusion, and further studies being made on others in addition to standardization of equipment, many committees on operation practices were in sessions. In the latter group were such committees as those on well spacing, various production and drilling practices, etc.

Abstracts of all the papers presented at the Division of Production meetings follow:

★ Pumping Slant Holes at Huntington Beach

D. K. Weaver, Wilshire Oil Company, Incorporated, Norwalk, California, explained how difficulties in pumping slant holes at Huntington Beach had been overcome by use of heavier equipment in the larger wells, and what steps were taken with other wells to solve pumping problems created by sand infiltration. He also gave a brief history of the drilling of slant holes, or oil wells which are given a drift out under tidelands in order to tap oil sands beneath the water. The wells were drilled with angles varying from 15 degrees to 62 degrees from vertical. Some of them produce from positions as much as 3000 feet from the surface location.

Weaver expressed the opinion that none of the slanted wells could be pumped at 100 percent of their ability, but showed steps taken that have permitted much improvement over earlier experiences.

Production costs have not proven excessive, in spite of the high angles of drift in the holes, but the author predicted that such wells could never be pumped to the stripper stage.

★ New Studies Relating to Pipe Thread Measurement

Deep drilling practices have created new problems in design and construction of drilling equipment, and have necessitated new studies looking toward the development of stronger joints in casing, it was reported by Blaine B. Wescott, Gulf Research and Development Company, Pittsburgh, in his paper, "The Measurement of Pipe Threads."

[*Continued on Page 12*]

Accident Prevention

Colorado Springs, Colo.—The American Petroleum Institute's Department of Accident Prevention held one group session during the Mid-Year meeting here, at which several phases of this work was covered in four papers. Abstracts of the papers follow:

★ Preventing Rotary Drilling Accidents

The problem of preventing accidents in drilling operations has become one of preventing human failure, R. B. Roaper, Humble Oil & Refining Company, Houston, declared in a paper "Preventing Rotary Drilling Accidents." Roaper stated that in the past few years manufacturers of oil field equipment have built safety into their products, so that today less than one percent of all accidents result from machinery failure. However, he said, rapid changes in drilling methods and equipment necessitate training personnel to the point where they can constantly adjust themselves to new conditions, while all job planning must include greater consideration of the safety feature of operations.

Figures given by Roaper showed that drilling is almost four times as hazardous as any other type of work in the industry.

Last year the accident frequency of Humble Oil & Refining Company in drilling was half that of the drilling operations throughout the industry. He explained the set up of organization and regulations used in order to accomplish this record. The company assigned one or more safety engineers to each of its divisions. He constantly gave assistance to all the supervisors. In addition, frequent meetings were held on regular schedules. Field safety commitees also were used to great advantage. They are composed of a chairman and two other members selected from among the employes. It is their duty to make monthly inspections of all properties. Contests, first aid work, manuals, and a program whereby employes receive monetary awards for suggestions in the improvement either of equipment or operating methods were used by the concern.

Roaper then went into a practical application of the principles of safety in all phases of actual drilling operations. The company has perfected a

Shown at A. P. I. Gathering

Byles reviews favorable business conditions.

★ ★ ★

Colley replaces Irish on Institute board.

Colorado Springs, Colo. — Gratification for the present large volume of oil industry business and optimism for its future prospects were the general undertones of the seventh annual mid-year meeting of the American Petroleum Institute. At the same time several warnings were sounded.

President Axtell J. Byles stated that during the first quarter of this year, the industry had enjoyed an 11.7 percent increase in the demand for crude oil and its products. An average of 14 percent more motor fuel was sold domestically and as foreign shipments than during the corresponding period a year ago, he declared. Continuing, Byles stated, "Domestic demand increased 12.5 percent, a rate somewhat higher than expected and due, no doubt. to the moderate winter weather as compared with the previous season.

"Crude oil production established a new high level of 3,551,950 barrels per day during the week ended May 15. It has been running between 3,450,000 and 3,550,000 barrels daily for the past several weeks, resulting in considerable additions to storage. These inventories were 288,000,000 barrels on January 1 and about 305,000,000 barrels on May 8, the latest week for which we have definite information. It is not improbable that these inventories may be shown to have reached 307,000,000 barrels when the May 22 figures are available.

Must Adhere to Allowables

"In these circumstances it is gratifying to see Texas accept the recommendations of the United States Bureau of Mines for June, following the lead of Oklahoma and Kansas in May. This is constructive, but does not solve the production problem resulting from increased drilling activity created by the failure to give due weight to the acreage factor. It is important that operators themselves exercise good judgment in the conduct of their drilling programs and that producers strictly adhere to state allowables.

"Demand for crude oil during the remainder of the year should remain high. If, however, the industry is to continue to enjoy good health, levels of crude oil inventories should be watched. This also applies to motor fuel inventories which were approximately 81,000,000 barrels at the end of April. The over-all inventory position of crude and products for the country as a whole is not now serious, but weakness is evident in certain limited areas. It is felt that where this weakness exists it can be corrected by more moderate seasonal increases in runs to stills.

"It is not too soon to give consideration to the effect of excessive gasoline inventories at the close of the summer season when faced with the difficulty of supplying fuel oil requirements without over-producing gasoline during the winter season."

Tax Rise Disturbing

Byles too pointed to the steady rise in tax rates as a very disturbing factor.

"In the past decade taxes paid to federal and state governments," he asserted, "have averaged approximately eight times the industry's earnings. The tax collector now is the largest single beneficiary of oil company income. In 1936 the tax collector received one-fifth of all operating revenues, with disbursements for taxes exceeding even wage payments by 20 to 33 percent.

"The obvious need is for a restoration of tax sanity and reasonable tax rates through reduction in the cost of government, federal, state and local. Most of the American people have to depend upon industry for their livelihood, and they would be directly benefited by any change in the tax situation which would permit money once again to flow freely through the channels of trade and find its way, through industrial buying and the payment of wages, into the family pocketbook," Byles declared in conclusion.

Resolutions Adopted

The American Petroleum Institute board of directors met on Wednesday and adopted several resolutions and approved several matters. Resolutions were passed urging the governors of the states to take such steps as may be necessary to promote public safety, to relieve unemployment, and to promote prosperity by confining the expenditures of revenues from gasoline sales taxes to highway financing.

Use of this income for highways is in accordance with the fundamental principle of taxing motor fuel, the resolution said, while the urgent need for public safety on the highways necessitates the use of all available highway revenue for the development of safe roads.

In a second resolution the board ex-

number of rather strict regulations to apply to this work, but they have been instrumental in assisting it to compile its safety record.

"I consider the selection of men of prime importance as a valuable aid in accident prevention," said Roaper. "It is just as important to place the right man on the right job as it is to select the proper tool for doing a specific type of work. All men are fitted by ability, inclination, and temperament to do certain jobs well. It is only by proper selection and placement that a harmonious and cooperative group can be developed with a guarantee of safe and efficient work."

★ The Use of Accident Prevention Manuals

Preparation of a "five-foot shelf of books on safety in the petroleum industry" was suggested by G. O. Lockwood, Empire Oil & Refining Company, Bartlesville, Oklahoma, as a means of providing oil company safety directors with necessary information. Lockwood recommended the use of the institute's accident-prevention manuals, good practice and safe practice codes, and other publications, and said that additional manuals should be prepared and published as needed, among them treatises on handling pipe, safe operation of gasoline plants, warehousing of materials, truck driving, loading and transportation, and safety educational methods.

Lockwood urged that manuals be prepared through cooperative effort, rather than by any one man. This would result in better ideas and a broader scope.

★ Value of Accident Statistics High

Frequency of injuries in the petroleum industry has been changed from 18 percent above the average of all industries to a point below the all-industry average, and there has been a change in accident severity from 30 percent above the all-industry average in 1927 to below the average in recent years, it was stated in a paper, "The Value of Accident Statistics" by H. N. Blakeslee, director of the American Petroleum Institute's Department of Accident Prevention.

"Accident statistics first interested oil company executives as a means of showing how effective had been their efforts in protecting the welfare of their own workers, but in more recent years accident records have become a measure of ability of operating supervisors and their crews. Frequent bad accidents are now considered as mistakes, or interruptions, which indicate inefficient operating methods. Today many oil company executives watch their accident statistics almost as closely as they do their cost accounts. The accident records are considered another index of the ability of those handling the jobs."

pressed sympathy to East Texas families who were bereaved by the destruction of the New London, Texas, consolidated school on March 18 last, and gave thanks and appreciation to oil companies and oil men who worked and who gave freely of time and funds to relieve suffering at the time of the disaster.

Two resolutions in memoriam were adopted, expressing the sorrow of the industry in the death March 6 last of Mark L. Requa, director of the oil division of the United States fuel administration during the World War, and in the death May 23 of John D. Rockefeller. The resolution revealed that Rockefeller's gift of $250,000 to the Institute in 1926 had instituted a five-year program of fundamental research and gave impetus to research as a continuing activity within the industry.

To Enlarge Drake Park

The board voted to deed to the Commonwealth of Pennsylvania a grant of 17 acres of land adjoining the Drake well memorial park near Titusville, Pennsylvania, for the purpose of enlarging the park. The land recently was deeded to the institute by former State Senator N. V. V. Franchot, of Olean, New York, and virtually doubles acreage of the park, which preserves the site of the first American commercial producing oil well completed by Col. E. L. Drake in 1859. It is regarded as one of the few parks developed by an industry to commemorate its beginning.

The resignation of W. M. Irish, former president of Atlantic Refining Company of Philadelphia, Pensylvania, was accepted by the board, which elected as his successor Robert H. Colley, who recently succeeded Irish as president of the company. A committee was appointed to draft a resolution of regret at Irish's resignation and to express appreciation of his services.

A recommendation of the American Petroleum Industries Committees advocating the separate posting of gasoline prices and taxes at service stations was adopted. The recommendation called for differentiation between prices of and taxes on motor fuel whenever shown upon filling station pumps, statements, bills, etc., so that consumers may appreciate the difference between the price of gasoline, which is the amount of money they are asked to exchange for a gallon, and the cost of gasoline, which is the price plus such taxes as may be imposed.

Approve Standard Measures

The board approved the recommendation of the committee on contracted ratios of standard weights and measures submitted by the chairman, Dr. L. C. Beard, Socony Vacuum Oil Company, Incorporated, New York, for the purpose of standardizing between nations the measurements used by the Petroleum industry in international trade and commerce.

The board approved a recommendation of the general committee of the institutes Division of Refining for the appointment of a special committee to study the problem of reporting refinery capacities and to make a report at the annual meeting of the institute scheduled for November 8 to 12 in the Stevens Hotel at Chicago. The objective of the committee is to develop a procedure to improve the accuracy of present figures purporting to show refinery capacities.

Finance Thread Tests

Financing of a new series of tests of two types of threads used in tubular goods employed in deep well drilling operations, as recommended by the general committee of the Division of Production, also was approved. The board authorized the expenditure of $3000 to cover the cost of having an observer representing the consumers study the tests, which are to be conducted at Pittsburgh, Pennsylvania. Approval was given to an expenditure of $1600 to meet the costs of observing tests already completed at Pittsburgh. The new series of tests will cover present rounded threads used on drill pipe and a modification of the present sharp V-threads used on various tubular goods.

More Engineering Progress

[*Continued from Page 10*]

The design of threaded joints for tubular goods is an important problem of the industry—so much so, that a cooperative investigation is in progress which has for its ultimate purpose a complete revision of the present pipe specifications of the American Petroleum Institute. The program includes the development of standard instruments and practice for gaging tubular goods. Wescott's paper presented a critical discussion of the various instruments available for the purpose and offered suggestions for incorporation in the proposed standard gaging practice.

Wescott warned that difficulties attending the setting of long strings of casing without leaks are forcing operators to consider the use of welded rather than threaded joints. He is of the opinion the taper of pipe threads can be measured best with dial-indicator calipers with ball tips, and that thread depth can be measured best with a dial indicator gage with a short travel stem having a 50 degree cone tip with a radius of 0.002 inches.

★ Benefits of the Unitization of Fields

The benefits of unitization, or community development, of oil fields as opposed to the disadvantages of competitive drilling and "boom" development, were shown in a paper by K. S. Salnikov, of Fairfax, Oklahoma, and M. L. Haider, of Tulsa, both affiliated with The Carter Oil Company. They discussed "Pressure Maintenance and Unitization in the South Burbank Field," explaining how unitized operation of this Oklahoma field had resulted in prolonging the flowing life, had increased recoveries, and had effected substantial economies in development and exploitation. Wider well spacing reduced material inventories, minimized overhead and labor costs, and standardization of equipment were cited as indirect benefits derived from consolidation of the oil-producing properties under one management and the promotion of a pressure-maintenance program.

Natural gas produced with the oil largely is returned to the pool through injection wells after the natural gasoline and other fuel content have been extracted, they said, thus maintaining the reservoir pressure and permitting continued production of oil chiefly by natural flow. They said the result has been to maintain the production of crude oil at a comparatively steady level month after month and to eliminate largely the physical waste of natural gas.

South Burbank field is located in Osage County, and comprises approximately 4000 productive acres, of which 2720 acres were unitized June 1, 1935. Unitization was effected by determining the reserves under each tract, the percent of participation in the unit being in the proportion that the reserve of each tract bears to the total reserve of the unitized area.

The purposes of the unitization were to carry out a pressure-maintenance project and to effect economies in the development and exploitation of the properties.

At present approximately 16,000,000 cubic feet of gas is being returned to the reservoir, which is equivalent to 1640 cubic feet per barrel of oil produced.

★ Standard Field Testing of Drilling Fluids Needed

The oil industry's present ability to drill wells to great depths, 12,000 feet and deeper, has necessitated careful preparation and control of drilling fluids in order to meet the high gas and water pressures encountered at deeper horizons, a paper entitled "Standard Practices for Field Testing of Drilling Fluids," stated. The authors, Carl E. Reistle, Jr., George E. Cannon, and R. C. Buchan, all with Humble Oil & Refining Company, Houston, presented a tentative standard code for testing drilling fluids. This code was developed after an extensive study of the subject by the Houston chapter of the American Petroleum Institute Division of Production, and later was studied by the division's topical committee on drilling practice.

It was suggested that the density be expressed in pounds per square inch pressure that would be exerted by a 100-foot column of the fluid. While this appears clumsy, and might require a little education it should make field men more pressure-minded and would make calculations in drilling-fluid control simpler.

Often viscosity data are used in reports, and only the time required is stated without mentioning the procedure used. This leads to confusion, and in an attempt to clear up this a standard for mud test and nomenclature was proposed. In dealing with viscosity as determined with a Marsh-type funnel, it was suggested a full funnel be used and the time required for the discharge be measured for 1000 cc.

Reistle, Cannon and Buchan included

tentative standard codes for determination of sand content, gelation and pH of drilling fluids as well.

★ Causes and Cure for Stuck Pipe

The story of how a miniature oil well was built of glass in the laboratory in an effort to ascertain the causes of frozen drill pipe and casing was told by J. T. Hayward, chief engineer of Barnsdall Oil Company. He described laboratory apparatus and tests which showed that stuck pipe can be freed by alternately starting and stopping the pumps, then recited experiences where the same means were used successfully in the field. In the laboratory, tapping the pipe lightly while under tension was also found effective, and this method also has been substantiated in the field by water-hammer vibration, induced by pinching the pump suction.

Glass Model Used

Hayward's model of an oil well for laboratory experiments was made of glass tubing to represent the drill hole. Bulbs blown into the tubing simulated caves in the hole. The drill pipe, or casing, was simulated by using smaller glass tubing, which was raised and lowered by hand winch, with the pull carefully metered. The larger glass tubing was filled with sand, and the smaller tubing inserted to within a few inches of the bottom. Pumps then were started and the action observed through the glass. It was found that in the enlarged portions of the hole, circulation of the fluid was slow and the sand tended to bridge, until the drill pipe was frozen fast. Stopping the pumps and ending the circulation causes the bridges to break, immediately freeing the frozen pipe.

Shows Cause of Bridging

In the laboratory experiments it was found that it was possible to stick the pipe by reducing the rate of circulation. At low rates of circulation and at some point in the hole that corresponded to a cave, the rate of upward circulation of the fluid became too slow to carry the larger particles, and they began to collect in the enlargement and form a loosely-compacted bridge. This bridge then acted as screen, and grains were slowly added to the lower end. The length of the bridge, therefore, constantly grew downward. Shutting off circulation under these conditions completely freed the pipe. Upon cutting off the circulation, the lower end of the bridge slowly melted away as the particles previously held in place by the pressure fell downward through the fluid.

With the model it was possible to determine that bridges may form in the annular space in two different manners. If circulation stopped, solids fall through the fluid, and the bridge builds upward. If circulation is on, the solids are carried up to some obstruction, as previously explained, and the bridge grows downward.

It appears, therefore, when pipe has stuck but circulation has not been lost, that one of tthe first remedial steps, stated Hayward, to be taken would be to shut down the pumps and relieve the pressure. If after five to 10 minutes this is not successful, alternate stopping and starting the pumps should be tried.

★ Vibration Problems In Oil Wells

The effect of vibration upon equipment used in producing oil from wells was discussed in two papers, one entitled "Vibration Problems in Oil Wells," presented by J. C. Slonneger of The Continental Supply Company, Dallas, and the other "Plunger Travel of Oil Well Pumps" by Robert William Rieniets, Sargeant Engineering Corporation, Huntington Park California.

Misunderstanding vibration problems has prevented their being given just consideration, Slonneger declared. He explained the desirability of knowing whether vibration was promoting or handicapping certain oil well operations.

The paper presented a simplified method of calculating vibration frequencies as applied to sucker rods and cable tools. In his discussion of the effects of vibration on well pumping, Slonneger disclosed that vibration of rods has a profound effect upon the contour of the dynamometer card.

Rieniets applied the theory of vibrations to the problems presented in calculating the plunger travel of a deep well pump, and demonstrated the use of a formulae in calculating plunger travel.

He declared that plunger travel is the result of: 1. A modified polished-rod stroke; and 2. A vibratory motion of the rods created by the periodically varying forces imposed upon them.

Continuing, Rieniets stated the amplitude of the vibratory motions would depend upon: 1. The magnitude of the disturbing forces; 2. The ratio of the period of natural vibrations of the system to the period of the forced vibrations; and 3. The magnitude of the damping forces present in the system.

★ Phase-Equilibrium and Estimation of Reserves

A paper on "Application of Phase-Equilibrium Data to the Estimation of Oil and Gas Reserves," by B. H. Sage and W. N. Lacey, of the California Institute of Technology, was a feature of the June 2 session. The paper was based on the thought that many natural petroleum reservoirs are of such complex stratigraphic configuration that it appears to be impractical to determine their contents by detailed estimates and studies. Under these conditions a more general microscopic approach will often yield results which are of value in the estimation of oil and gas reserves and in the determination of the effects of differing production techniques upon reservoir conditions. The paper dealt largely with the application of certain laboratory and eld measurements to the estimation of oil and gas reserves.

The actual phase behavior of fluids within a natural reservoir is recognized as an exceedingly complex physical phenomenon, and at the present time information concerning the stratigraphic location of these materials within the reservoir is uncertain. The reservoir is treated as a system of variable volume from which hydrocarbons are removed only in two ways. One of these is by production of gas and oil from wells by tapping the reservoir, and the other is by the loss of oil from the effective reserve as the result of its occlusion or isolation by the advancing edge water.

Several Assumptions Involved

The approach to the estimation of underground reserves involves several assumptions as to the behavior of the hydrocarbon material within the reservoir. As a first approximation, it is desirable to assume that the hydrocarbon materials are at thermodynamic equilibrium at all times within the reservoir. Due to the large heat capacity of the formation, it seems reasonable to assume that all changes that take place within the reservoir as a whole may be considered as isothermal. For present purposes it has been assumed that there is a negligible effect of water upon the thermodynamic behavior of the hydrocarbon material.

A knowledge of the oil and gas production from the reservoir is the primary source of field information employed. Values of average reservoir pressure must also be available at several times during the production history of the field. A knowledge of the reservoir temperature is necessary in order to permit the application of the laboratory measurements. All types of field data must be utilized in the final estimation of oil and gas reserves.

The formation volume is solely a function of the equilibrium pressure and temperature and of the composition of the mixture as a whole. There is some uncertainty as to how closely equilibrium is followed within a reservoir during the production period.

The paper was prepared as a review of what can be done with present laboratory and field equipment in the investigation of the conditions that exist in actual reservoirs, and not as a new approach to this important problem.

★ Need Index to Recoverable Oil in Each Tract

Equitable proration demands that each lease or proration unit recover its own oil, according to conclusions drawn by Lyndon L. Foley, who read a paper June 2 on "Proration of Allowable Oil Production." To accomplish this it is necessary to determine an index of the recoverable oil of each tract. Several factors enter into the determination of an equitable index.

Various proration plans may be rated as to fairness through recognition of factors that give an index that will permit the recovery of the correct percentage of oil in place under each tract.

The paper pointed out that "per-well allowables" are equitable only if well spacing and reservoir conditions are uniform. "Straight potential" is equitable only if well spacing is uniform and if well potentials are proportional to recoverable oil in place in the drainage of each well. "Per-acre allowances" are equitable only if reservoir conditions are uniform.

Acreage Allowable Not Sufficient

"Acreage allowance plus any other allowance" will not give allocations proportional to the recoverable oil under each lease. "Acreage times poten-

tial" is equitable only if potentials are proportional to the recoverable oil under a lease. This plan gives each lease a per-acre recovery proportional to the well potentials.

"Acreage times index of recoverable oil" is equitable if the index of recoverable oil is accurate. This plan gives each lease a per-acre recovery proportional to the index of recoverable oil, and is reasonable in the light of our knowledge of indices of recoverable oil at any given time it may be applied.

The application of a reservoir-pressure factor to any of the above proration plans may correct wholly or partly any inherent inequity of the plan. Any factor which is considered indicative of the recoverable oil under a lease or proration unit must be multiplied by the acreage of the tract to determine the proration factor.

★ Witness Should Consult Attorney Before Testifying

The paper presented June 2 by William M. Fleetwood on "A Witness's Duties and Rights," was a departure from the usual run expected at a meeting of this kind, but it was well received because of the increasing amount of litigation in some quarters. It was pointed out that witnesses should familiarize themselves with a few general principles that may be of assistance to them in presenting their testimony. It is difficult to find such guidance for prospective witnesses, although there are many works having as their objective the assistance of attorneys in presenting their cases.

A person expecting to be a witness in a case has the responsibility of becoming acquainted with the entire case and with his part in it by discussing it in detail with the attorney before the trial. In this manner the witness can prepare himself properly for both direct and cross examination.

The general duties of the witness are to testify responsively, audibly, understandably, and respectfully. The principal duty is to testify truthfully.

The witness has the right to depend on the court and counsel for proper guidance and protection, to have questions simply and properly phrased, to refuse to answer in the absence of knowledge, to answer fully and with proper explanation, freely to admit having discussed the case with others, and to deliberate briefly before answering any question.

It should be remembered that there are many questions that can not be answered satisfactorily with a simple "yes" or "no," although many attorneys and judicial officers will hold to this procedure.

★ Too Much Abuse In Handling Tubular Goods

Oil country tubular goods have been abused so much in handling as to render of prime importance an immediate improvement in handling practices. This was the principal thought carried in a paper by L. R. Smith, Tide Water Associated Oil Company, on "Abuse in Handling Tubular Goods." Improper methods of handling pipe from the mill to the consumer and abuse in field operations were stressed.

The abuse in handling tubular goods begins at the mills, and in the loading and unloading of cars and ships, due care often is not exercised to avoid damage to the threads or to the body of the pipe. A marked improvement has been noted during the past few years, however, and the movement now under way to eliminate many of the present abuses undoubtedly will reduce damage to tubular goods.

A very moderate blow on the threaded portion of oil country tubular goods may result in distortion of the thread to an extent greater than the variation allowed. Threaded protectors are a necessary adjunct to the preservation of undamaged threads, but experience has shown that threads can easily become damaged with the protector in position. In the unloading of railroad cars, spacers and bracing are at times carelessly placed. Under such conditions the load may shift longitudinally, allowing the end of the pipe to strike or rub against the end of the car, or even reach the next car.

Protectors may run off through vibration, and careless workmen often unload the pipe when protectors are not in place. Damaged threads usually follow such careless operations.

In motor trucking there is as much chance for damage as at other points along the line. In placing the pipe on truck or trailer the usual precautions must be taken in the location of the spacing strips, and the load must be securely lashed to prevent slipping. It is also important that a dolly be used when the truck is not of sufficient wheel base properly to support the length of the pipe joints. Instance of damage from dragging have been observed.

When unloading pipe in the field, it is dangerous to cut the load loose so the joints will roll. When the truck is considerably higher than the pipe rack, the terrific bumping given the couplings and protectors may be reflected at a later date by pipe failure in a difficult line of operation.

It is important that all types of tubular goods be properly handled during "in and out" operations. Both casing and drill pipe failures are common where the making up crew has been careless. Threads too tight or too loose may lead to serious failures. A slight dent at a crucial point in the threads may lead to serious trouble in drill pipe strings. Apparently insignificant abrasions on the outside of drill pipe often cause serious trouble. Washouts from slip cuts are common, while fatigue failures are increased by slight damage that escapes the careless crew.

It is concluded that on the whole there is still a great deal of room for improvement in the methods employed in the handling of tubular products, both by the manufacturer and the consumer.

★ Progress Report On Cooperative Pipe Tests

C. W. Froome, Union Oil Company of California, chairman of the engineering subcommittee on pipe for the division of production of the institute, read a report of the progress made to date in the institutes cooperative pipe tests.

During the past several months manufacturers of pipe have been making a series of tests in which samples of threaded joints containing different errors in various items were subjected to pressure tests. Briefly, the pressure tests consisted of applying methane under varying pressures, allowing each pressure to remain on the made-up joints for a period of one hour. The pressures were from 500 pounds to 3500 pounds in 500-pound steps. The 3500-pound pressure was held for 24 hours.

After describing the tests and results, Froome stated that the indications to date are that perfect threads exceed the manufacturers' estimated ultimate loads as computed from A.P.I. setting depths. The threads having errors show a tendency to be appreciably weaker.

"In conclusion," he declared, "the test program is merely started, but the indications to-date have led the author to the following opinions:

1. Threads having tapers deviating from the correct taper by the now allowed tolerance do not lend themselves to making a tight joint without thread injury.
2. Sufficient thread lubricant of the proper type is necessary to make any joint tight under high gas pressure; and
3. The information obtainable from this test will be of sufficient value to more than pay the costs of completing the program. The benefits will be to the manufacturer as well as to the user.

"The partial results discussed positively indicate the necessity of more serious consideration of tolerance and suggest that threading practices are in need of improvement if good joints are to be expected."

Continuing, Froome stated that the tests and observations made on the products now being furnished lead to the following conclusions:

1. Adequate and definite thread specifications are vitally necessary.
2. Instruments of sufficient accuracy to check threads within the specifications must be provided.
3. Sufficient inspection by using the above instruments should be carried out by the manufacturer.
4. To avoid accidental shipping of poor threads, the threading equipment should be of such a nature as to easily produce threads passable under the specifications.
5. Specification as to speed and torque to be used in making up couplings should be adopted and enforced.
6. Proper care should be exercised to protect the product after inspection at the mills.

TEXAS HEARING

Austin.—Texas oil men have been called to the regular state-wide proration meeting on June 18 to discuss the ever-growing problem of how to divide a relatively static state outlet among a growing number of wells.

The state-wide hearing was dated this week at a time when from all over the state operators bombarded the commission with pleas for higher allowables than were provided in the June schedule sheets.

Engineers unofficially say that never was the demand so great for relief from the constantly dwindling per-well allowables brought about by continuation of the drilling campaign in Texas.

Six leading producing states, yielding 92 percent of the country's crude oil output, propose to hold production within 1 percent of demand as estimated by Bureau of Mines.

Prospects Improved By June Allowables

New proration schedules are strictest of year, and promise to halt overproduction of crude and the running of oil to storage, following excessive output for four months.

By L. J. LOGAN, Associate Editor

CONTRIBUTING largely to the present favorable situation and outlook in the oil industry is the particularly encouraging program of crude oil production allowables for June.

The six leading producing states, which account for over 92 percent of the current United States crude oil production, have prescribed for June state allowables that conform very closely with the forecasts of market demand as determined by the United States Bureau of Mines.

Strictest Allowables of Year

In fact, the June allowables of these six leading states are nearer the federal bureau's recommendation than for any other month this year. In the aggregate, the state allowables exceed the recommendations only 29,412 barrels daily, or nine tenths of one percent.

These June allowables offer the promise that crude oil production will be nearly if not entirely within market requirements during the month.

Better Results Promised

It is indicated, consequently, t hat June perhaps will bring at last an interruption of the protracted over-production of crude and of the running of crude oil into storage.

The indicated better balancing of production with demand gives promise, moreover, of firmer markets for both crude and refined oils, and of possible further improvement of prices for both the raw material and the products.

The allowables in the six leading producing states for June are considerably stricter than in May, in relation to the indicated demand.

While the six states together for June have allowables 29,412 barrels a day, or 0.9 percent above the Bureau of Mines recommendations, they exceeded the allocations in May by 96,736 barrels daily, or 3.1 percent.

May Production Above Demand

The May allowables were sufficiently lax to result in further overproduction of crude and the continued running of crude into storage. Between May 1 and May 22 a net addition of 1,722,000 barrels of crude went into storage. For the rest of the month figures on crude stocks are not available, but since crude production in late May was setting new all-time records, it is indicated that some further additions to storage were made, despite heavy processing of crude at the refineries.

Better Balance in Prospect

In view of these additions to crude storage in May under the state allowables then prevailing, it is indicated that June will bring a partial, if not complete, elimination of overproduction and additions to storage.

The June allowables exceed the federal bureau's estimates of demand 65,324 barrels a day less than did the May allowables. That means that if the allowables are adhered to as well in June as in May, the production will be sufficiently nearer the actual market requirements to eliminate the running of about 2,000,000 barrels of crude to storage in June.

It is indicated, therefore, that much progress will be made in June toward bringing about again a very

Changes in United States Crude Oil Stocks in 16 Weeks, By Districts

Figures are from weekly reports of the Bureau of Mines, and indicate barrels.

Grade of Crude Oil	January 23	May 15	Change in Period
Pennsylvania Grade	4,111,000	4,069,000	— 42,000
Other Appalachian	795,000	837,000	+ 42,000
Lima-N. E. Indiana-Michigan	803,000	1,351,000	+ 548,000
Illinois-S. W. Indiana	9,583,000	9,715,000	+ 132,000
North Louisiana and Arkansas	10,459,000	9,379,000	— 1,080,000
West Texas and S. E. New Mexico	28,034,000	30,870,000	+ 2,836,000
East Texas	18,989,000	23,442,000	+ 4,453,000
Other Mid-Continent	113,928,000	124,504,000	+10,576,000
Gulf Coast	24,044,000	26,189,000	+ 2,145,000
Rocky Mountain	25,883,000	25,594,000	— 289,000
California	29,608,000	29,044,000	— 564,000
Foreign	1,874,000	2,471,000	+ 597,000
Total reported weekly	268,111,000	287,465,000	+19,354,000
Estimates of unreported stocks	17,100,000	17,900,000	+ 800,000
Total stocks	285,211,000	305,365,000	+20,154,000

State Allowables Compared With Bureau of Mines Recommendations

(Barrels Daily)

Month and State	Bureau of Mines Recommendation	*State Allowable at Beginning of Mo.	Excess of State Allowable	Percent Excess
January, 1937:				
California	559,900	†551,000	‡8,900	‡1.6
Kansas	165,600	175,851	10,251	6.2
Louisiana	216,300	240,650	24,350	11.3
New Mexico	79,800	92,800	13,000	16.3
Oklahoma	573,100	573,100	.....	....
Texas	1,176,000	1,248,780	72,780	6.2
Total six States	2,770,700	2,882,181	111,481	4.0
Total Nation	2,998,000	.....	.....	....
February, 1937:				
California	573,300	†551,000	‡22,300	‡4.0
Kansas	170,000	187,918	17,918	10.6
Louisiana	225,100	235,700	10,600	4.7
New Mexico	81,600	97,600	16,000	19.6
Oklahoma	581,900	581,900	.....	....
Texas	1,203,400	1,329,478	126,078	10.5
Total six States	2,835,300	2,983,596	148,296	5.2
Total Nation	3,068,000	.....	.....	....
March, 1937:				
California	570,900	†551,000	‡19,900	‡3.6
Kansas	178,000	186,968	8,968	5.0
Louisiana	240,000	236,000	‡4,000	‡1.7
New Mexico	88,200	103,200	15,000	17.0
Oklahoma	590,700	620,460	29,760	5.0
Texas	1,256,600	1,398,514	141,914	11.3
Total six States	2,924,400	3,096,142	171,742	5.8
Total Nation	3,159,000	.....	.....	....
April, 1937:				
California	579,900	580,000	100	0.0
Kansas	183,000	190,200	7,200	3.9
Louisiana	244,800	235,675	‡9,125	‡3.7
New Mexico	91,400	106,400	15,000	16.4
Oklahoma	609,600	620,460	10,860	1.8
Texas	1,297,900	1,348,964	51,064	3.9
Total six States	3,006,600	3,081,699	75,099	2.5
Total Nation	3,243,000	.....	.....	....
May, 1937:				
California	583,300	603,900	20,600	3.5
Kansas	187,100	187,100	.....	....
Louisiana	249,400	240,900	‡8,500	‡3.4
New Mexico	99,800	114,000	14,200	14.2
Oklahoma	622,700	622,700	.....	....
Texas	1,340,800	1,411,236	70,436	5.2
Total six States	3,083,100	3,179,836	96,736	3.1
Total Nation	3,332,900	.....	.....	....
June, 1937:				
California	585,900	603,900	18,000	3.1
Kansas	190,700	190,700	.....	....
Louisiana	252,000	254,650	2,650	1.0
New Mexico	102,000	114,500	12,500	12.2
Oklahoma	625,300	625,300	.....	....
Texas	1,354,000	1,350,262	‡3,738	‡0.3
Total six States	3,109,900	3,139,312	29,412	0.9
Total Nation	3,366,000	.....	.....	....

*Allowable indicates daily average for month in California, Kansas, Louisiana, New Mexico, and Oklahoma; except that Rodessa, Louisiana, field allowable increases with completion of new wells; and New Mexico sometimes is revised at middle of month. In Texas, the allowable is as of the first day of the month, and gradually increases as new wells are completed.

† Recommendation of Central Committee of California Oil Producers.

‡ State allowable below Bureau of Mines allocation.

close balance between production and market demand.

Output Excessive Most of Year

If the June allowables prove strict enough to eliminate overproduction, they will correct an unfavorable situation that has persisted for about four months, or most of this year.

Crude oil production was thrown out of balance with market demand in January, and the balance had not been restored at the middle of May. Consequently, there developed considerable anxiety over the excessive production, and conservation officials of the leading producing states cooperated generally in paving the way for a reduction of the excesses when they promulgated allowables for June.

Excess Due to Lax Allowables

Overproduction was started when some of the leading producing states liberalized allowables for February, and it was increased when lax control was extended through March. Whereas the state allowables of the six leading producing states had been within 4 percent of the Bureau of Mines recommendations in January, they exceeded the federal schedule 5.2 percent in February and 5.8 percent in March. Consequently, while production had been under demand in January, it rose above the demand. Whereas crude stocks had declined about 2,000,000 barrels in January, they increased about 3,000,000 barrels in February and 9,000,000 barrels in March.

April Allowables Cut Back

Since it was evident that the allowables were too high, the state officials cut them back for April to within 2.5 percent of the Bureau of Mines allocations.

However, in the meantime, the federal bureau had adopted a somewhat less conservative attitude in recommending production levels, since it previously had been under-estimating requirements consistently.

Furthermore, there appeared to occur in April some leveling out of the previously sharply rising trend of oil consumption.

Also, there developed some diminishing of the effectiveness of the state allowables that were prescribed, and production of some of the states did not conform as closely as before with the allowables.

In consequence of all these altered conditions, even the tightened allowables of April proved too large, and overproduction of crude continued, bringing further additions to storage. During the month about 6,000,000 barrels of crude oil went into storage.

May Control Not Effective

However, the figures revealing the continued heavy additions to crude storage in April had not yet become available when the May allowables were prescribed, and the May control was not quite as strict as that of April. May allowables of the six leading states were 3.1 percent above the Bureau of Mines recommendations. And as brought out above, overproduction of crude continued in May, and crude stocks were increased further by 2,000,000 barrels in the first half of the month.

Effect of State Allowables on Crude Oil Stocks

PERIOD—	Barrels Crude In Storage
January—	
January 2, 1937	287,659,000
January 30	285,384,000
Change in period	— 2,275,000
February—	
January 30	285,384,000
February 27	288,121,000
Change in period	+ 2,737,000
March—	
February 27	288,121,000
April 3	297,374,000
Change in period	+ 9,253,000
April—	
April 3	297,374,000
May 1	303,249,000
Change in period	+ 5,875,000
May—	
May 1	303,249,000
May 15	304,971,000
Change in period	+ 1,722,000

CAUSE AND EFFECT OF

Frozen Drill Pipe and Casing

By J. T. HAYWARD,
Barnsdall Oil Company,
Tulsa, Oklahoma

THE author describes laboratory apparatus and tests which show that stuck pipe can be freed by alternately starting and stopping the pumps; he then recites experiences where the same means were used successfully in the field. In the laboratory, tapping the pipe lightly while under tension was also found effective, and this method also was found to be substantiated in the field by water-hammer vibration, induced by pinching the pump suction. Comparative values of power required to free pipe are given for regular pipe with couplings, and flush-joint pipe. Field experiences are cited, including use of oil to free pipe, remedies used to overcome "key seating" (slotting of well bore), and other causes and cures for frozen pipe.

This paper was presented at Seventh Mid-Year Meeting, American Petroleum Institute, at the Broadmoor Hotel, Colorado Springs, Colo., June 2, 1937. The statements and opinions expressed herein are those of the author, and should not be construed as an official action or opinion of the Institute or of this journal.

ONE of the most serious accidents that can happen to a well is the sticking of casing, drill pipe, or tubing. Very little has been published regarding the cause and prevention of these accidents, and even less about overcoming them when they have occurred.

The writer believes that much is to be learned both regarding prevention and cure, and in this paper attempts a beginning of this task. During the last several months scraps of information and case histories have been collected as they came to hand. It is realized that the value of the material here presented varies widely, and it has been difficult to arrange in a coherent manner.

When a string of drill pipe sticks, the usual thing is to start pulling and slacking off—although these operations are seldom successful. In territories such as Oklahoma City, oil spotting offers a good chance of success, but even on this there is no general agreement regarding the best method of procedure. Should the pipe be held in tension, or should it be alternately pulled and slacked off? What is the best oil to use? How much should be used?

The problem may be attacked along two principal lines: 1, research with small-scale apparatus in laboratories; 2, the recording and studying of actual field case histories.

Regarding the latter, the Institute's Topical Committee on Drilling Practice recently circulated a questionnaire regarding causes and cures of stuck pipe. A few replies have already been received, and contain a great deal of valuable information indicating great interest in the matter under discussion. Although this is far too extensive for inclusion here, a few quotations are given where they help the discussion.

The selection of the quotations used was made by the writer of this paper, and covers but a very small fraction of the valuable information contained in the replies.[1] The opinions expressed in connection with them are also personal, and do not necessarily represent the majority opinion contained in the replies.

A short while ago a liner and screen were being set in a Gulf Coast well. The back of the screen and the face of the sand were being washed by pumping water down the tubing and up behind the screen, which was suspended from the tubing preparatory to setting the packer. Just about the time that it was decided to set the packer, the liner was found to be stuck; and, as the screen was 10 feet off bottom, it was too high up to make the completion. Alternate pulling and slacking off were resorted to without success. The pumps, which were already compounded, were speeded up, as circulation had not been altogether lost—and this also was unsuccessful. When there appeared to be no prospect of freeing the liner, it was decided to turn loose from it, mud the hole, and extract the tubing in order to go back in with the drill pipe to cut and fish out the liner. To change the pumps over to mud required their being shut down for a few minutes and, fortunately, but accidentally, they were stopped before turning loose from the liner. At this time there was a tension in the tubing somewhat greater than the total weight of the tubing and liner; and 30 seconds after stopping the pumps, the liner freed itself—the weight indicator dropping to the reading that corresponded to the weight of the tubing and liner. The liner was lowered into place, and the well completed without further difficulty.

The writer wondered at the time whether the freeing of this liner when it did was a case of coincidence, or whether shutting off the circulation and relieving the pressure was—although unpremeditated—the right thing to do under the circumstances. Inquiries made during the next few days elicited in-

[1] Many further replies containing valuable information have been received since this paper was compiled.

formation regarding certain similar cases; for instance, a driller remembered a 7,000-foot string of drill pipe that became stuck while preparations were being made to cement. It could not be freed by pulling; circulation became more and more difficult, until finally the hose blew off, after which the pipe freed itself in between 1 and 2 minutes.

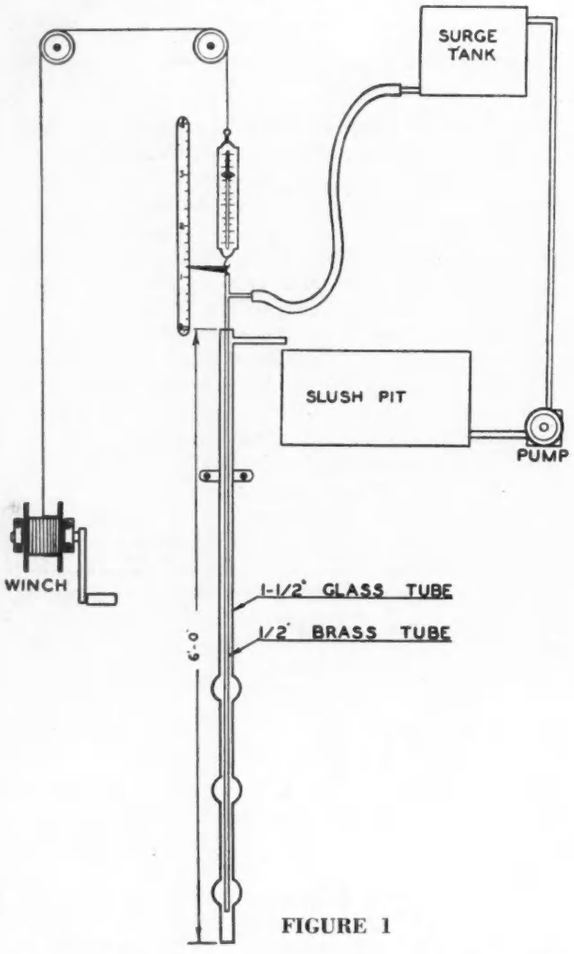


FIGURE 1

An Inquiry was addressed to a number of drilling superintendents and contractors. One of the questions asked was: "do you know of any case where the pipe, having stuck, stopping circulation freed it?" To this G. Elias[2] replied:

> "We know of one case where drill pipe was stuck; and, although circulation was comparatively free, yet as soon as circulation was stopped and the drain on the pump delivery opened, letting off pressure freed the string.
>
> "A few days ago we had a special case where, on completing the running in of a new bit, the driller—apparently through carelessness—did not know that he was near bottom, and let the bit drop heavily on bottom. The bit entered the formation, stopping up the circulation holes. Circulation could, therefore, not be obtained, and the drill pipe was found to be stuck hard. After trying for some time to get circulation and at the same time to free the drill pipe by moving it, we bled the pressure off, and immediately the string was freed. We have frequently had cases where, on running the bit to bottom after changing, we found it difficult to start up circulation and, on getting circulation with difficulty, the drill pipe became sticky.
>
> "Under such circumstances we have found on some occasions that on stopping the circulation the drill pipe will become free; however, the risk of losing circulation is so great that we usually attempt to keep it at all costs, as it would give us a bad job if we stopped and thereby lost circulation without freeing the bit."

T. E. Stickle[3] also wrote saying that it was by no means uncommon for stuck pipe to come free upon stopping circulation.

Test Experiments

This matter appeared to offer a promising direction for small scale experiments. It was hoped that the conditions could be duplicated and the cause of the behavior found.

The apparatus shown in Figure 1 was set up. A 6-foot length of 2-inch inside-diameter glass tubing was clamped to the wall, and represented the hole. Bulbs were blown in the tubing to represent caves in the hole. The drill pipe, or casing, consisted of a 7-foot length of ½-inch tubing (⅞-inch outside diameter). This drill pipe could be raised and lowered with a small hand winch—the pull being read on a spring balance, and the movement or creep measured by a pointer attached to the drill pipe and traveling in front of a vertical scale. As will be seen in Figure 1, means for causing and maintaining circulation were provided.

When the pipe is stuck, the force holding it may be looked upon as an interfacial shear acting between the surface of the pipe and the material that is in contact with and gripping it. Knowing the length of the pipe gripped, the interfacial shear can be calculated as follows:

Let D=outside diameter of pipe, sq. in.
L=length gripped, in.
p=the effective pull, lb.
S=the interfacial shear, lb. per sq. in.

Then $S = \frac{P}{\pi DL}$ lb. per sq. in.

With this apparatus attempts were made to simulate the conditions on the Gulf Coast well mentioned in a previous paragraph, and it was soon found that the freeing of the liner upon stopping circulation was not a coincidence. The glass tubing was filled to a height of 4 feet with river sand, and the tubing which was plain and without any collars, circulated down to 6 inches off bottom through the sand. By reducing the rate of circulation, it was possible to stick the pipe, and steady pulls for extended periods or alternately pulling and slacking off would not free it. Shutting off circulation under these conditions completely freed the pipe in periods varying from 30 seconds to 30 minutes in 75 percent of the trials. In the other 25 percent re-starting the circulation for a few moments and then again stopping it freed the pipe.

The tubing being of glass, it was possible to observe what was happening in it. At low rates of circulation and at some point in the hole where there is a change in cross sectional area such as at one of the bulbs—which, of course, corresponds to a cave in a real well—the rate of upward circulation of the fluid becomes too slow to carry the larger particles, and they begin to collect in the enlargement and form a loosely-compacted bridge. This bridge then acts as a screen, and grains are slowly added to the lower end. The length of this bridge constantly grows in a downward direction. Circulation apparently takes place through fine channels; and, as the bridge grows in length, it becomes more and more

[2]G. Elias, general superintendent, Phoenix Oil and Transport Co., Ploesti, Roumania.

[3]T. E. Stickle, drilling superintendent, J. E. Mabee Interests, Tulsa, Okla.

effective as a filter bed—new material constantly being added to and held on the lower end by the upward pressure of the fluid. Upon cutting off circulation, the lower end of the bridge slowly melts away as the particles previously held in place by the pressure fall downward through the fluid. This melting away continues until the bridge has been completely eaten away and the pipe is freed.

to stand 10 minutes—after which it was found to be perfectly free. The experiment was repeated, the period during which the pipe was allowed to stand being increased up to 24 hours without the pipe freezing. During these tests, although it was found that the pipe would not freeze if left undisturbed, it would immediately stick if given a few light taps with a pencil and, that once stuck in this manner, it

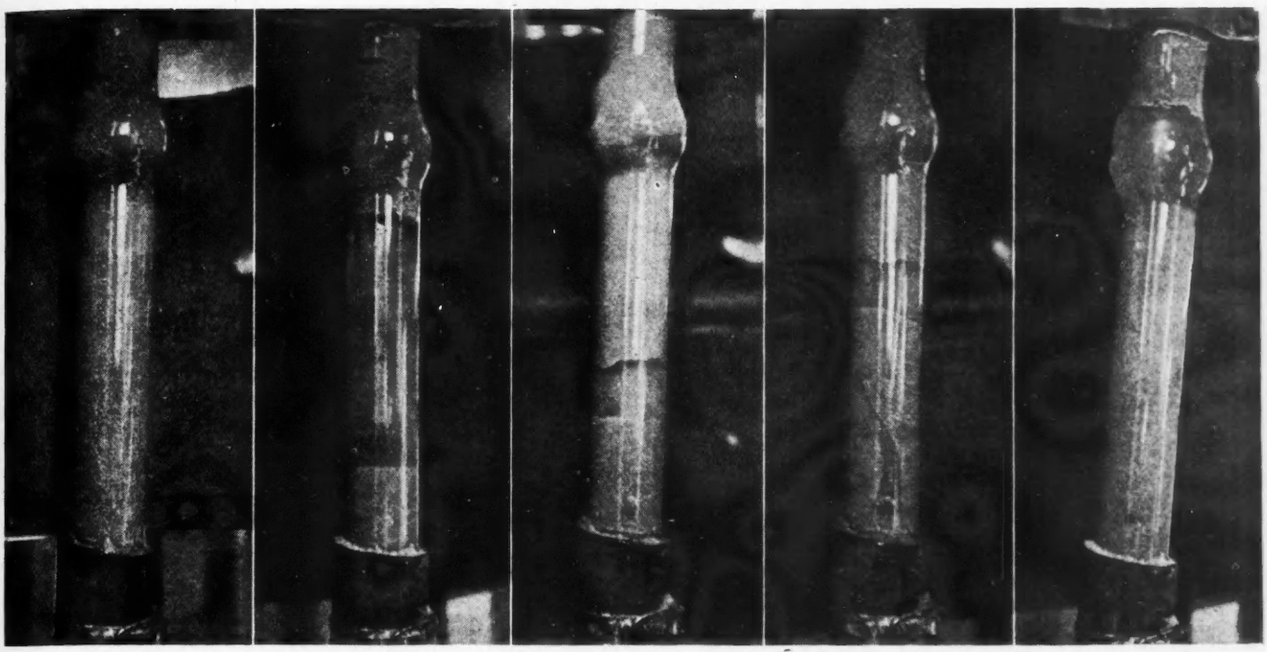


FIGURE 2

Figure 2 shows photographically the formation and decay of a bridge as described above. When the first three pictures were taken, circulation was on, the upper bridge growing downward, sand grains being constantly carried from below and added to its lower surface. The last two pictures show the reverse process, circulation having been shut off and the bridge decaying as the material drops from its lower face.

With this model it easily can be seen that bridges may form in the annular space in two different manners. If circulation is stopped, solids fall through the fluid, and bridge builds upward. If circulation is on, the solids are carried up to some obstruction, and the bridge grows downward. In a few cases decay of the bridge after circulation had been stopped would not be complete, the lower face of the bridge being sufficiently compacted to stand up. In such cases decay of the bridge could always be re-started by stopping and starting circulation a few times.

It appears, therefore, when pipe has stuck but circulation has not been lost, that one of the first remedial steps to be taken would be to shut down the pumps and relieve the pressure. If after 5 to 10 minutes this is not successful, alternate stopping and starting the pumps should be tried.

Many additional tests have been carried out with the model already described.

The hole was filled to a height of 4 feet with river sand, screened through a 10- and retained on a 40-mesh screen. The pipe was circulated down through the sand until it was a couple of inches off bottom. Circulation was then stopped, and the pipe allowed

could not be freed by the maximum pull of 100 pounds that could be exerted with the equipment. It should be emphasized that the jar required to cause the pipe to freeze was of the very lightest, being nothing more than a couple of light taps on the upper end of the string.

The amount of sand in the hole was reduced until only 1 foot of the pipe was buried in the sand and stuck. Even on this short length the full tension of 100 pounds could be exerted without freeing it. This gives a shear of:

$$S = \frac{100}{2.75 \times 12} = 3 \text{ lb. per sq. in.}$$

Applying this shear to 6⅝-inch drill pipe, we get a friction of 720 pounds per foot of length, or 72,000 pounds per 100 feet gripped.

Accidentally it was found that, while a slight jar was required to cause the pipe to stick, a slight jar was also effective in freeing it. Pipe stuck as described above, that could not be freed by a steady pull exerted over extended periods, or oft-repeated pulling and slacking off, could be freed immediately by a light pull accompanied by a slight jar. Again it should be emphasized that the jar required to free the pipe was surprisingly light.

At first sight it may appear curious that jarring should both cause the pipe to stick and free it. The action appears similar to the action of slips. If tubing or casing is struck with a hammer when the weight is resting on the spider, the slips will set more firmly. If, on the other hand, there is tension in the tub-

ing, or casing when it is struck, the slips are loosened and the pipe is freed.

These experiments were repeated with different sands with similar results.

It often happens that water hammer, caused by a faulty valve or the absence of an effective air chamber, causes vibration in the drill pipe or casing at a well. In the light of these experiments, it would appear that such water hammer is likely to compact any bridges of sand or cuttings already formed, and should be avoided wherever possible. On the other hand, when pipe has stuck and circulation can still be obtained, it would appear that water hammer, intentionally introduced and accompanied by tension, should be one of the procedures used in efforts to free the pipe. Violent water hammer can usually be set up by pinching the pump suction.

Jars and jigger bars are tools often used with success to jar the pipe and free it. The jigger bar is a long, solid steel mandril run on a sand line. A short steel mandril, with water courses to permit circulation, is first dropped in on top of the bit, and is struck by raising and dropping the jigger bar some 40 or 50 feet upon it.

In order to have a standardized method of producing the slight jarring required to freeze or free the pipe, a small electric buzzer was mounted on the top end of the string. This buzzer is shown in Figure 3, which is a photograph of a more recent installation of the model apparatus already described. The buzzer is driven by a three-volt battery, the leads being attached to the hose on their way to the battery. When in use, although this buzzer could be heard, the vibration could not be felt by touching the pipe.

H. W. Manley and C. B. Johnson have carried out many experiments with this apparatus. Their complete test results are too extensive for inclusion here, but a few of their findings may be mentioned.

It was found that the friction developed was proportioned to the time the buzzer was on. For instance, using a through 60-mesh, stay-on 80-mesh, sand and 30 inches of plain ½-inch pipe buried, the interfacial shear developed was 1 pound per square inch per 5 seconds that the buzzer was on—the relationship continuing up to the maximum pull of 100 pounds that could be exerted with the apparatus.

Using a 10- to 40-mesh sand and 30 inches of pipe with three collars on it buried, the viscosity of the fluid was changed by the addition of "aquagel" to the water. Table 1 shows the relationship between the viscosity, the time the buzzer was on, and the pull required to free the pipe.

A viscosity of somewhere between 8 and 10 centipoises appeared to be critical. With fluid of this viscosity, under no circumstances with any of the sands tried could the pipe be stuck or any measurable friction developed.

A series of tests were made with cuttings taken from an Oklahoma City well. With cuttings obtained between 2000 and 5600 feet there appeared to be no tendency to stick. Cuttings obtained from 5600 to 6200 feet showed an increasing friction, but the interfacial shears measured did not exceed 0.25 pound per square inch which is, of course, very small compared with sand. These cuttings were next screened so that the grain sizes would correspond with sands used, but still would not stick the pipe. Under the microscope the irregularity of the grains, sand and cuttings, appeared similar, and the specific gravities were the same, viz., 2.64. The reason for the difference in behavior is so far unexplained, but may be due to a difference in hardness. The screened cuttings were composed, roughly, of 60 percent shale, 15 percent limestone, and 25 percent sand. At the time these tests were made drilling mud from the well from which the cuttings were obtained was not available, and water was used as the fluid. Surprisingly, it was found that the addition of 4 percent by weight of a native Oklahoma clay to the fluid caused the pipe to stick—interfacial shears of 3 to 5 pounds per square inch being developed.

It is realized fully that these tests were superficial, and that much further experimenting along these lines remains to be done.

The addition of collars (standard ½-inch) to the test string greatly increased the liability to stick, and the interfacial shears developed. A single collar screwed on the bottom of the tubing, with 30 inches buried in unscreened river sand and 5 seconds of vibration with the buzzer, raised the pull required to free from 25 pounds to 100 pounds.

Since the scale effect might be expected to affect greatly the results with such a small-scale model, efforts are being made to determine the relative merit —from the point of view of liability to freeze—of collared and flush-jointed pipe by means of full-scale tests. These tests are being carried out at a test well belonging to Spang, Chalfant & Company at Pittsburgh, Pa. A start only has been made with these tests, and they have not progressed beyond the sand and water stage. The following quotation is from a report written by W. M. Frame, director of research, Spang, Chalfant & Company:

"In general, the tests consisted of packing wet sand around three types of 4¾-inch casing joints and measuring the load required to pull the casing out of the sand. The purpose of the tests was to determine the relative loads necessary to free API threaded and coupled casing, extreme line casing, and flush outside-diameter casing. The test set-up is shown in Figure 4.

"Six lengths of 4¾-inch API threaded ends were coupled[1] into a stand of about 57 feet over-all length. Six extreme line joints of the approximate same lengths were made up. Three plain end lengths were butt-welded to a flush outside diameter. The joint arrangement of each is shown in Figure 5 and also in Figure 6, which pictures a cross-section of the joints in sand. Headers were welded to the bottom ends of each (also shown in the sketches). This was done to prevent sand from getting inside the joints in the hole.

"Two lengths of 9⅝-inch x 43.5 pound API casing, approxi-

[1]Hereafter in this paper these will be referred to as "T and C" ends.

TABLE 1

Effect of Fluid Viscosity on Stuck Pipe 10- to 40-Mesh Sand

Amount of Gel Material to Water—by Weight (Percent)	Viscosity (Centipoises*)	Viscosity, Marsh Funnel (Seconds†)	Time of Vibrations (Seconds)	Pull to Free Pipe (Pounds)	Remarks
..	..	..	5	68+	Pipe stock
2	2	30	12	68+	Pipe stock
2	2	30	15	68+	Pipe stock
4	4	33	7	44	
4	4	33	12	68+	Pipe stock
4	4	33	15	68+	Pipe stock
5	8	37	15	8	
5	8	37	20	8	
5	8	37	40	12	
5	8	37	90	20	
6	14	43	15	Free	
6	14	43	40	Free	
6	14	43	90	Free	

* Stormer viscosity at 600 r.p.m.

† 1,500 cc. in and 1,000 cc. out.

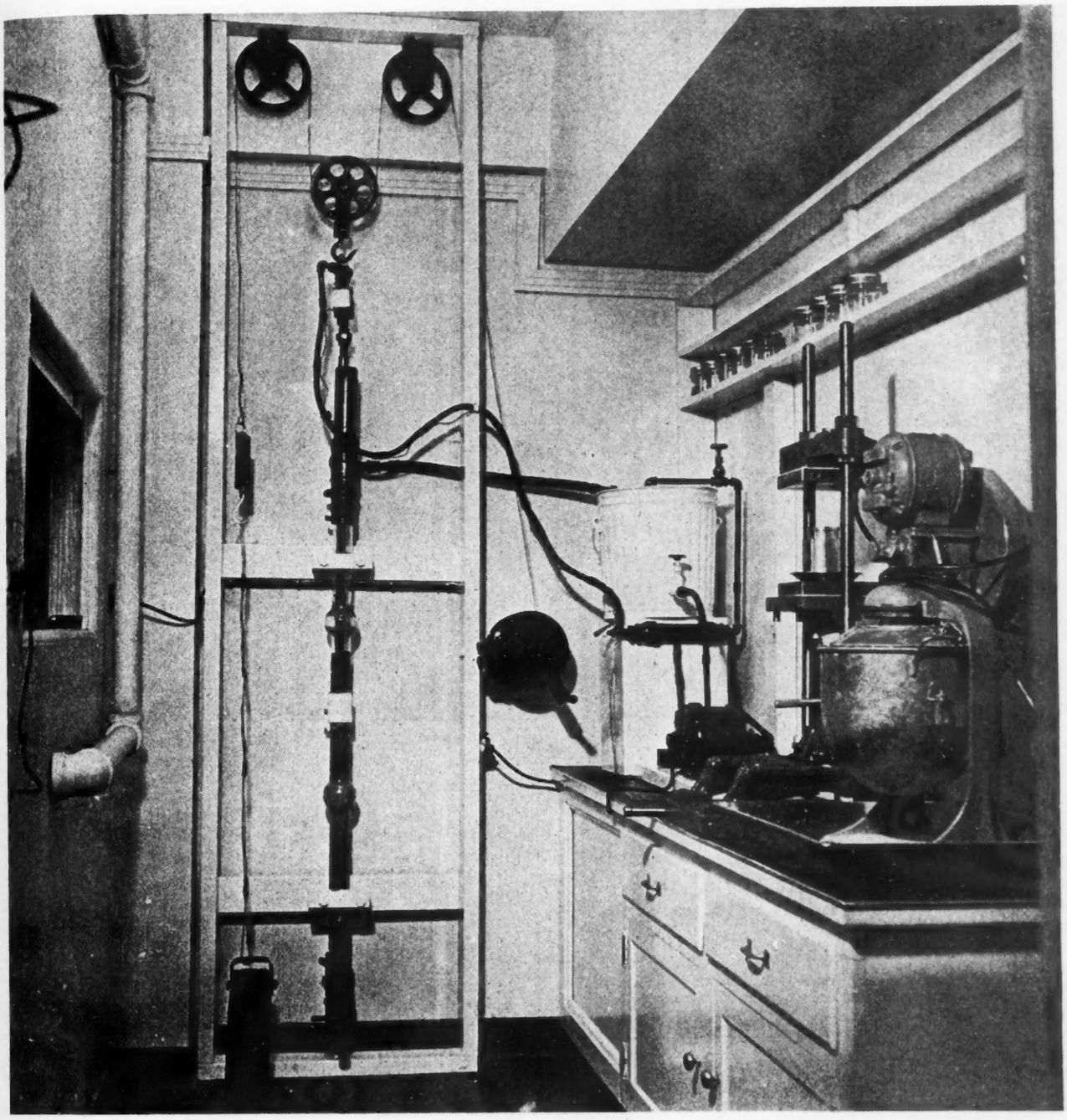


FIGURE 3

mately 5 feet less than the 4¾-inch casing, were coupled and a header welded to the bottom coupling to hold the sand. The sand used for these tests was ordinary river sand sifted through a 20-mesh screen, and 20 feet of each string was buried in the sand for the tests (see Figure 6).

"The 4¾-inch casing was attached to the hook and pulled by means of the drawworks. The 'hole' out of which the 4¾-inch pipe was pulled was represented by 9⅝-inch casing which was bolted to the derrick-floor beams. The dead line was strung from the crown block and around a snatch block at the derrick floor, and fastened to the hook of a crane scale. The capacity of the crane scale was 10,000 pounds; and, as there were four lines suporting the hook, the maximum pull that could be measured was 40,000 pounds. A known amount of wet sand was shoveled into the funnel, shown in the photographs, and allowed to pack by gravity between the two stands of casing. It was found that this method of forming the bridge could be duplicated more accurately than allowing the sand to settle through a column of water. The method of forming the bridge was not considered important for the purpose of these tests, but the ability to duplicate results was considered important.

"The test results indicated that, at least in some instances, the API T and C stand required over twice the load to pull it out of the sand bridge than was required for extreme line casing. Also, the load necessary to free the extreme line casing was about five times that of the flush outside-diameter casing. The test results were not entirely satisfactory due to the erratic results obtained for the T and C stand.

"One very interesting result of the action of the sand was observed. As can be seen in Figure 7, severe abrasions occurred on the surface of the pipe for a distance of about 20 inches just above each API coupling. Not only was all the scale removed, but the metallic surface was badly scuffed. The darker areas remote from the coupling are patches of tight, hard scale remaining on the pipe. Practically no abrasion was detected on the remainder of the surface up to the next coupling. Also, there was very little

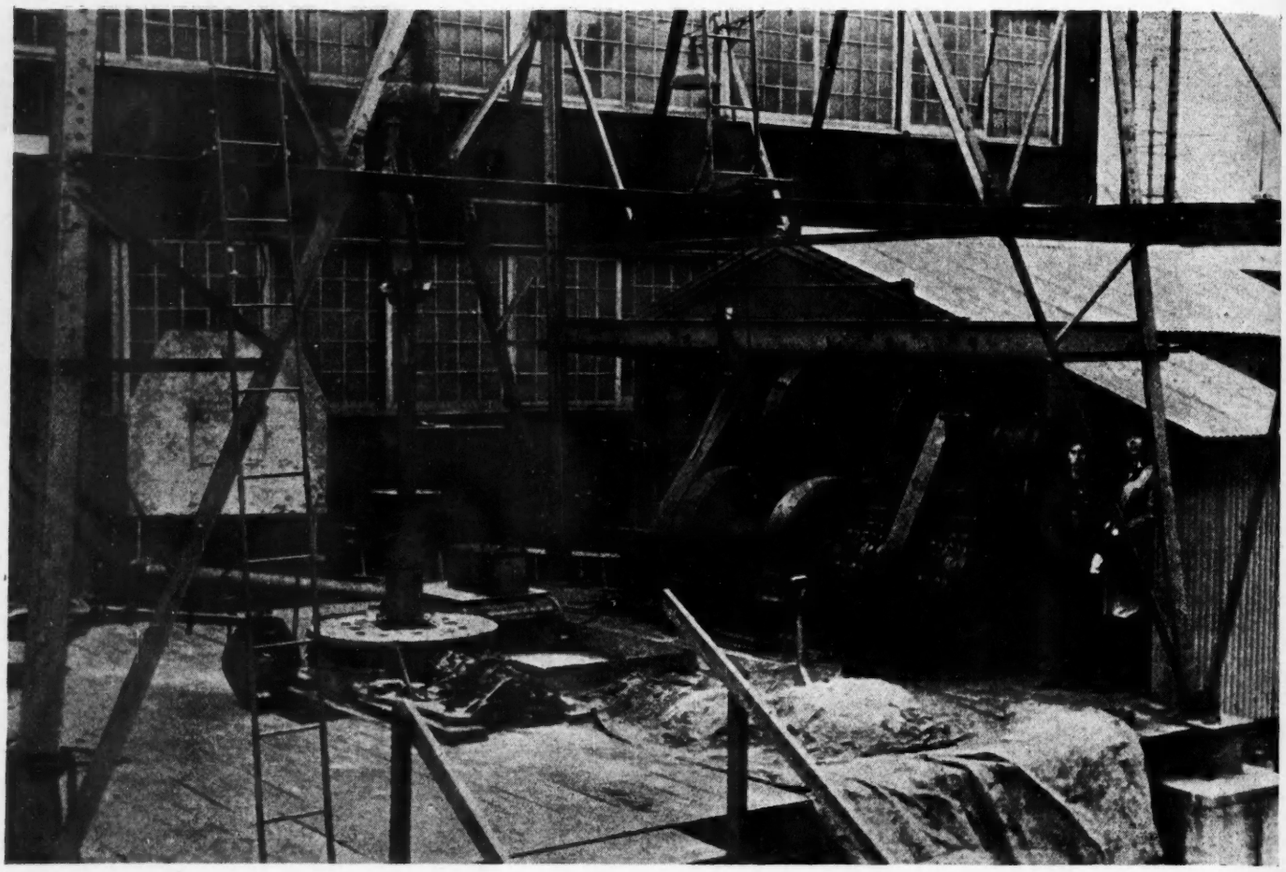


FIGURE 4

abrasion on the surface of the coupling, as can be seen from the photograph.

"The presence of the abraded surfaces indicates that at these locations pressures of great magnitude existed. Apparently the coupling shoulder, as it moved upward, carried along a cone-shaped segment of sand which obtained a reaction from the sides of the hole and packed the sand tighter—thus setting up a great pressure against the surface of the pipe.

"Probably the conditions favoring the formation of these 'sand wedges' are critical (i.e., in the way the sand packed around the couplings, particularly at the top shoulder) for the methods used in these tests, and this may account for the erratic results obtained for this type of joint.

"The abrasion was much less severe on extreme line casing (Figure 8). The machined surfaces of the joints were painted. Only part of the paint and very little of the scale were removed. There was no scuffing of the metallic surface. The tool marks on the joint can be plainly seen.

"With the flush-joint pipe very little sign of abrasion could be detected."

The test results indicated that the T and C pipe could not be freed with the maximum available pull of 40,000 pounds, unless supplemented by vibration induced by striking the pipe with a sledge hammer.

The extreme line pipe, under similar test conditions, was freed with pulls of 17,400 pounds, 14,800 pounds, and 10,800 pounds on three consecutive tests, or an average of 14,300 pounds.

The flush-joint pipe required pulls of 3200 pounds, 2400 pounds, and 3280 pounds, or an average of 2960 pounds.

Pipe Stuck by Boulders

It is not believed that large boulders are responsible for the sticking of pipe. To be heavy enough to stick a string of pipe, a boulder would have to be several feet in diameter. Such a boulder could not fall into a 10-inch or 12-inch hole; and it is also difficult to see how it could be disturbed in its socket, sufficiently to move, by the drilling of a 10- or 12-inch hole past or through it. Regarding boulders, C. D. Miller[5] says:

> "Frankly, with the exception of a string or two stuck immediately under the surface, I have never seen a string of pipe stuck by so-called boulders. It is quite possible that there are some parts of the country in which this does occur. In the wells where the pipe was stuck immediately below the surface, the pipe was freed by working. In the cases described above, it was necessary to run a second string of surface pipe in order to keep the boulders from getting into the hole."

More briefly, G. A. Collins[6] and C. L. Brewster[7] say:

> "No pipe stuck by boulders in our experience."

Of course, a small boulder or pebble may drop into the hole and wedge above a collar or the bit assembly. In such cases the pipe should be easily freed by working and crushing the pebble.

Pipe Stuck by Sand or Cuttings

This probably accounts for the majority of cases of stuck pipe. Bridges may be formed in two ways: by settling, in which case the bridge grows upwards; or, when there is circulation, by a bridge growing downwards in the manner described in an earlier paragraph in connection with the tests made with the small-scale model. Preventive measures are as follows: To keep the mud in proper condition:—If the viscosity of the mud is correct, it will carry the cuttings out and prevent them from collecting at en-

[5] C. D. Miller, general superintendent, production department, Barnsdall Oil Company.
[6] G. A. Collins, member of California District Committee on Drilling and Production Practice.
[7] C. L. Brewster, drilling superintendent, Shell Oil Company of California.

largements in the hole and forming a bridge. The tests with the model also indicate that a colloidal material, such as "aquagel," forms a sheath over the particles, and prevents them from packing and getting a grip on the pipe. Proper pits and/or shale shakers are also of importance to reduce the amount

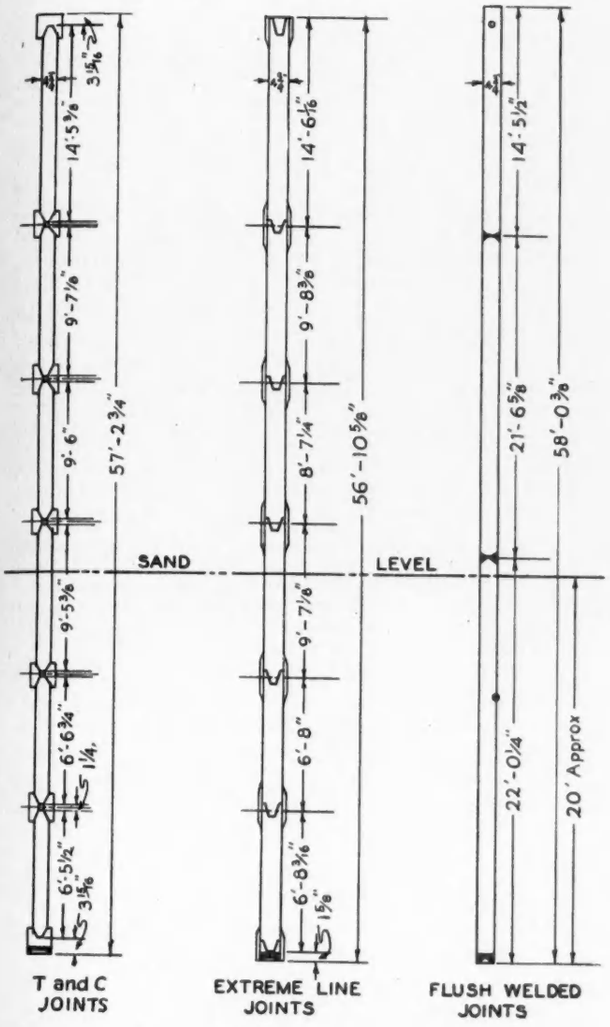


FIGURE 5

Joint Arrangement of 4¾-inch. Frozen Casing as Set in 9⅝-inch Casing.

of sand and cuttings in the hole. On this matter, J. E. Warren[8] says:

> "Mud conditions, design of pits, and use of a shale shaker are the most important things to take into consideration in an area where cuttings and cavings are responsible for stuck pipe. Cuttings will lodge in washed-out pockets or solution pockets in salt where the size of the hole has been considerably increased over its drilled diameter. These places represent points of reduced velocity in the circulating drilling fluid, with resulting deposition of cuttings. The cuttings are kept buoyed up while circulating, but will tend to settle down around the drill stem when circulation is cut off, and may stick the pipe. Conditioning the mud to reduce washing out by using wall building materials and saturated brine solutions in salt materially reduces trouble of this kind."

Again, Ralph Will[9] says:

> "One of the chief preventatives for avoiding being stuck by cuttings or cavings is to be sure that the bit is hoisted off bottom always before the mud pump is shut down. A heavy mud at high viscosity, and the hole kept full while making a trip so as not to lower the wall pressure, are some of the most effective measures to observe. Increasing the rate of circulation as much as possible will carry cuttings from the hole at a higher rate of speed and avoid 'sifting back' of the cuttings. Ordinarily, cases of so-called caving will be avoided by keeping the fluid level at the surface while making trips."

On the some subject, C. J. Gibson[10] has to say:

> "Keep mud in proper condition, and I would not restrict drilling speed or amount of hole per hour. In a hole that is caving, it is best to leave off reamers and all drill collars that are not necessary."

Should the pipe become stuck, in spite of all precautions, efforts to free it should be directed along the following lines: If circulation can still be obtained, intermittent starting and stopping the pumps should be the first thing tried—the pressure being released each time the pumps are stopped and tension held in the pipe. If this does not succeed, an effort should be made to induce vibration, which may be done by pinching the suction of the pump to cause water hammer. It is, of course, important to hold tension in the pipe continuously while there is any vibration; because, as has already been shown,

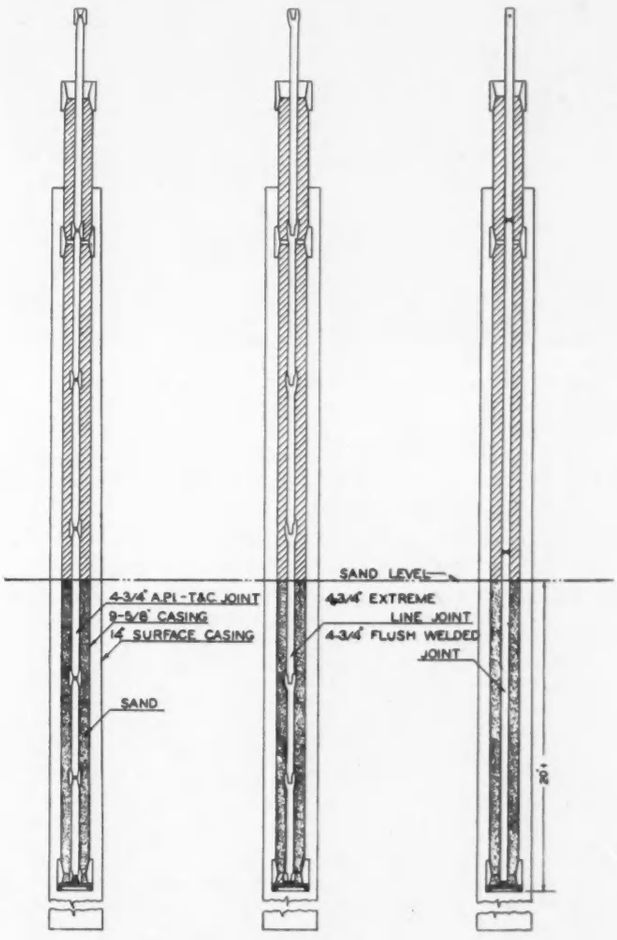


FIGURE 6

4¾-inch Casing Joints as Frozen in Sand.

vibration without tension tends to stick the pipe all the tighter. If these efforts fail, the next step would appear to be to spot or circulate oil. All correspondents were agreed upon the value of oil spotting, al-

[8] J. E. Warren, drilling superintendent, Carl B. King Drilling Company.
[9] Ralph Will, general superintendent, Rocky Mountain Drilling Company.
[10] C. J. Gibson, assistant general superintendent, Rocky Mountain Drilling Company.

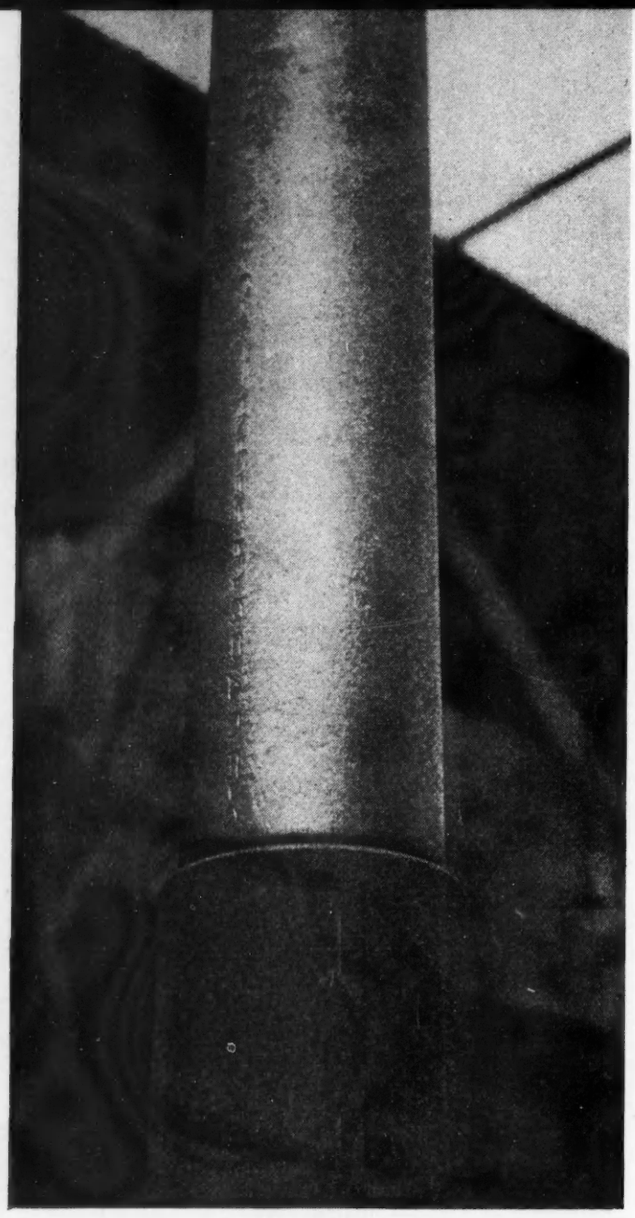


FIGURE 7

though there appears to be disagreement as to the proper method of carrying it out. The following quotations, it is believed, describe the best practice:

According to Brewster and Collins:

> "Loosening stuck drill pipe with oil: If circulation is had, pump in measured volume of oil, usually 25 barrels to 50 barrels, followed by mud to place oil around bit, leaving an excess of oil inside of the drill pipe. Hold strain on the pipe; and, if same does not come loose in a reasonable time, start up pump for several strokes to pump fresh supply of oil around bit. Then release bleeder on pump to surge oil back through the bit, and continue to hold strain. If this spotting of oil does not result in loosening of the stuck drill pipe in a reasonable time, circulation of oil is then resorted to if possible."

J. E. Brantly[11] states:

> "When pipe begins to stick or begins to pull hard, provided the bit is not on bottom, it should, of course, be slacked off in an attempt to force it downward. It should then be rotated and circulated. If the pipe is stuck with shale, the most effective means of freeing is by spotting oil. This we generally do by pumping in 30 barrels or 40 barrels, displacing about one-half of it into the area where we assume the pipe to be stuck, which is generally at the bit. At 15-minute intervals we move about 1 barrel from the drill pipe or past a given point in the hole. A strain is held on the pipe continuously, which strain was taken before the oil was spotted. Ordinarily the pipe will come loose after a few hours. The circulation of oil is sometimes resorted to of necessity, although it should always be avoided, if at all possible, because of the very harmful effect to the walls of the hole. If the pipe is stuck by sand and circulation is possible, we have found that the most effective means of freeing the pipe is by circulating a 1 percent or 1½ percent 'aquagel' solution. The spotting of oil will likewise frequently free the pipe when stuck in sand; but, because of its harmful effect to the walls of the hole and the mud, it is to be avoided."

[11] J. E. Brantly, consulting engineer, Los Angeles, Calif.

According to Gibson:

> "First determine where pipe is frozen. This can be done by taking a tension on the pipe. Oil can be pumped to the bottom of the hole, and let set for an allotted time; and, if the pipe is not free, keep moving the oil up the hole at the rate of about 4 strokes of the pump every 20 minutes."

It is believed that some of the success attributed to the circulation of oil in the past was really due to the stopping and starting of the pumps, which is involved by the operation of oil spotting; and that oil spotting or circulation should not be resorted to until conditioning of the mud, alternate stopping and starting of the pumps, and water hammer have been given a thorough trial. When working with the experimental apparatus, it was noticed that if a bubble of air accidentally got into the circulating system, it was very effective in breaking down any bridge and freeing the pipe; and, in this connection, it is interesting to note that J. E. Warren says:

> "Where high-pressure gas is available, it is sometimes possible to 'slug' the gas with the mud through the drill stem, and by the increased velocity to free the pipe in this manner. If any of these methods are not successful, in my opinion the only alternative is to wash over and cut the pipe out in sections."

If circulation has been lost, the procedure would appear to be to pull tension in the pipe and jar by means of the jigger bar or with water hammer. Even when there is no circulation, considerable vibration can be caused by stopping and starting the pumps while opening and shutting the blow-off.

Caving and Sloughing

The walls of the hole sometimes cave or slough, and cause sticking of the pipe. Prevention and cures are similar to those for trouble due to sand and cuttings, which have already been discussed.

Key Seating

This is a trouble that appears to be on the increase, and occurs especially in the deep wells drilled through the softer formations. J. E. Warren describes it in the following words:

> "I believe that another major reason for stuck drill stem is the 'key seating' of a crooked hole. Pipe stuck by this reason may result in a tedious expensive fishing job. Where a hole deviates from the vertical as little as 4 degrees and straightens up on drilling deeper, a portion of the hole must act as a bearing for the drill stem. When a depth has been reached so that this point of bearing is opposite drill stem under tension, a definite pulling effect on the formation results. Rotation combined with circulation enables the drill pipe itself to drill a 'key seat' into the wall if the formation at the point of bearing is of a character to permit it."

In addition to the wearing of the slot during rotation, described by Warren, it appears probable that the groove is cut by the sawing (broaching) action of the collars on the string of pipe during going in and out of the hole. This would not occur with flush-joint pipe, but no information is available as to whether or not key seating does occur with flush-joint pipe. Regarding preventive measures, Warren further goes on to say:

> "Keep the hole straight. At Rodessa it has been found advisable to restrict the deviation from vertical to 1

degree or less. If key seating does develop, to run a reamer in the drill stem at this point to keep the 'key seat' reamed out to full diameter."

It would appear possible that the top of the drill collar or of the reamer, if one is used, could be designed in such a manner that upon rotation it would tend to work the assembly out of the key seat. Should the pipe become stuck by pulling the bottom assembly into the key seat, and be unable to be loosened by slacking off, the jigger bar is a most effective tool for knocking it loose.

Of course, when knocked loose, the trouble is not over, as the bit assembly will probably again stick in the slot when an effort is made to come out of the hole. Rapid rotation while pulling up will, if there is any out of balance in the bit assembly, sometimes throw the pipe out of the slot and permit extraction. In some cases before cutting, it would appear worthwhile to set the string down on bottom and slack off with a view to kinking one or more of the lower standards. Rapid rotation while raising may then pull the pipe out of the slot. All else failing, the usual procedure is to knock the pipe loose, cut a few joints above bottom, run a reamer and ream out the key seat and, finally, fish out the pipe and bit assembly left in the hole.

Sticking by Balling Up

Drill pipe, and occasionally casing, stick when being pulled from the hole by the collection of sticky material on the collars and the bit assembly. The trouble is caused by the condition of the mud. A *Drilling Mud Handbook*[12] describes the trouble as follows:

"Open-Hole Diameter Decreased by Wall Thickness:

"Many times when running in casing there will be a point in the open hole below which the casing cannot be lowered, even though the hole had been reamed to a diameter which should allow ample clearance. There can be no accounting for the decreased diameter of hole except through the filtering out of a thicker wall than that normally expected. These stuck-casing incidents always occur in wells which have been using muds low in gel-forming colloids just prior to the setting of casing.

"The foregoing holds true for cases where a bit becomes stuck and cannot be drawn through the hole which it has just drilled. Here the wall above the bit continues to increase in thickness until the formation is completely sealed off against filtration; and, if the formation is a porous one, or if the mud is high in total solids, the hole becomes so chocked up with wall that there is no longer clearance for the bit. Such walls slough off or are knocked off by the bit or drill pipe, but are again built up to their original thickness as long as the same type mud is used."

Preventative measures are to condition the mud and to increase the rate of circulation. What may be called proper mud will vary according to the district, but a 15-centipoise mud with 2 percent by weight of a gel-type colloid is, in general terms, a suitable drilling fluid. Before coming out of the hole, the circulation should be continued without drilling until the bit assembly is clean and free; and if at any time while coming out it shows signs of sticking, circulation should be resumed until the trouble is cleared. The cure also lies in conditioning the mud, if circulation can be obtained; and, if this is not successful, oil circulation should be resorted to.

Collared and Flush-Joint Pipe

The tests with the small-scale apparatus and the full-scale tests at the Spang Company well in Pittsburgh indicated that collared pipe was more likely to stick than flush-joint. Of the 28 replies received to the question: "which do you consider least likely to stick, collared or flush-joint pipe?" 27 answered: flush-joint pipe.

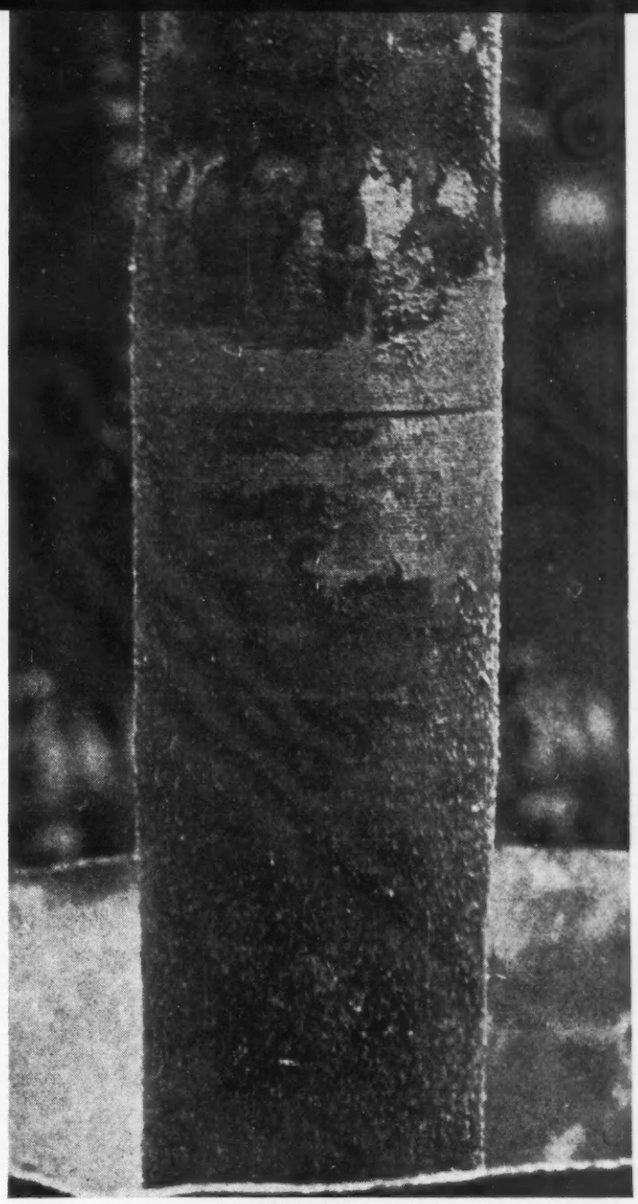


FIGURE 8

Should Circulation Be Continued If Pipe Is Stationary?

It sometimes happens that, due to one cause or another, pipe cannot be moved for a while; and the question arises as to whether, in order to prevent the pipe sticking, it is better to continue or stop circulation. To this Phillip Taber[13] replies:

"It is better in practically all cases to shut off circulation, occasionally starting the pumps for a moment, to prevent plugging of the bit by cuttings settling upon it. The only exception is when drilling through shallow sands with very thing drilling fluids, under which circumstances it is probably better to continue circulating."

Stickle and Elias agree with this recommendation.

Heaving Shale and Blowouts

The sticking of pipe by heaving shale or due to blowouts is considered to be outside the scope of this paper.

Acknowledgments

Acknowledgement is due to Messrs. H. W. Manley for continuous help given in the preparation of this paper, to C. B. Johnson, Jr., for the work carried out with the test model, and to Carl Reistle, chairman of the Institute's Committee on Drilling Practice, for the assistance given us in collecting information from various drilling superintendents and contractors, and to Spang, Chalfant & Company and the Baroid Sales Company for experimental work done, and to the many correspondents who have furnished information.

[12] Baroid Sales Co., *Drilling Mud Handbook*, Los Angeles, May, 1931.
[13] Phillip Taber, (partner) Taber & Coleman, drilling contractors, Tulsa, Oklahoma.

STANDARD PRACTICES FOR

Field Testing of Drilling Fluids

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THE successful completion of wells drilled to deeper horizons where high gas and water pressures may be encountered necessitates careful preparation and control of the drilling fluids.[1, 2] The prerequisite of proper mud control is the accurate determination of the various mud properties in order that desirable characteristics can be built into the drilling fluid. In the past operators have used numerous methods and apparatus to determine individual properties of mud; and each has, in most cases, selected for his own use some one test for each mud property.[3] In discussing mud properties, the lack of standard tests makes it difficult to correlate or understand the results obtained with varying types of mud in different areas and by individual operators.

In an effort to standardize the methods of testing muds, the Houston Chapter of the Institute's Division of Production made an extensive study of the subject, and proposed a standard on methods, instruments, and nomenclature for testing rotary-drilling fluids. Although this work stimulated standardization in that area, it has not resulted in a general standardization throughout the industry.

The subject of standardization of mud tests, with particular attention to field testing, was studied by the Division of Production's Topical Committee on Drilling Practice at the Chicago meeting in November, 1936, and a tentative code was adopted. It is possible to standardize the tests for determining mud weight, viscosity, gelation, sand content, and acidity and alkalinity. In some drilling operations other properties of the mud must be considered; however, in most cases mud control can be confined to those properties listed above.

Since most operators are familiar with the problems involved in attempting to arrive at standard tests suitable for all conditions, the authors have attempted to confine themselves to the more pertinent questions which arise in selecting test methods.

Density of Drilling Fluid

Much has been written in the past in regard to the necessity of maintaining a certain hydrostatic head against the formation to prevent gas and water infiltration into the hole being drilled.[4] This hydrostatic head must be greater than the formation pressures encountered, since the effect of swabbing [5] (when removing the drill stem), gas-cuttting, and variations in fluid densities must all be overcome by increasing the over-all density of the drilling fluid.

Various methods of measuring density, or weight of a given volume of mud, have been used in the field; but at this time the mud hydrometer, illustrated in Figure 1, is generally accepted as the best and most reliable equipment available for making

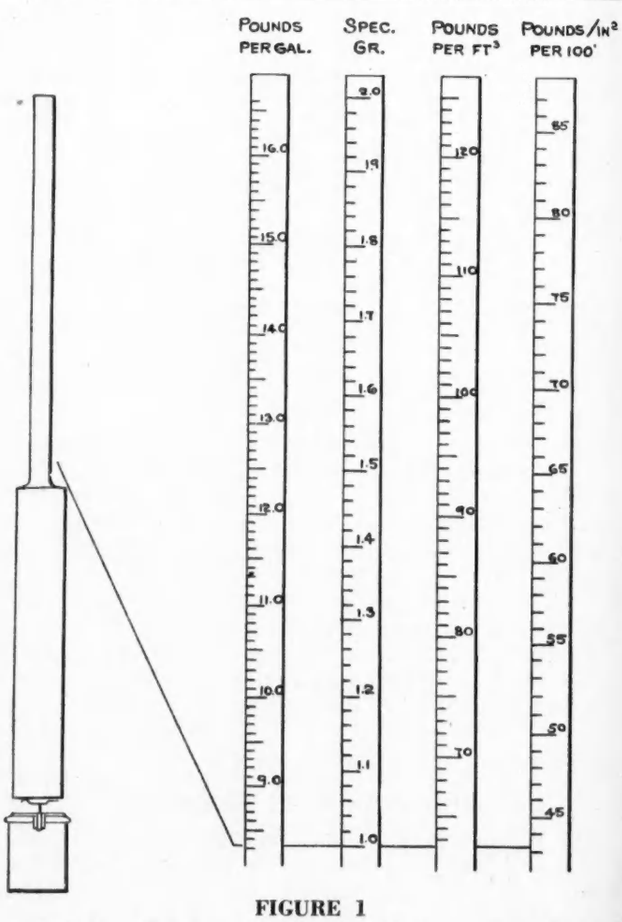

FIGURE 1
Relation Between Various Mud Hydrometer Scales.

CAREFUL and accurate testing of drilling fluids has become a necessity, especially in exploring and completing wells in the deeper horizons.

This paper presents a tentative standard code for the determination of density, viscosity, sand content, gelation, and pH of drilling fluids. The various tests are discussed; and, where the length of the discussion must be limited, references have been included which give more detailed treatment of the subject.

This paper was presented at Seventh Mid-Year Meeting, American Petroleum Institute, at the Broadmoor Hotel, Colorado Springs, Colo., June 2, 1937. The statements and opinions expressed herein are those of the authors, and should not be construed as an official action or opinion of the Institute or of this journal.

this determination. The instrument requires occasional calibration, which is readily accomplished in the field.

Before this type of mud hydrometer came into common use, operators weighed a given volume of fluid with spring-type scales or balances. The scales and balances were hard to keep in good repair. The capacity of the buckets varied considerably from their intended capacity. Many careless practices inherent in the use of these instruments contributed to very inaccurate determinations.[6]

As far as the units of measurement are concerned, there has been a varied practice—with most operators using pounds per gallon or pounds per cubic foot as units. The suggestion has been made that the density be expressed in pounds per square inch pressure that would be exerted by a 100-foot column of the fluid. This appears clumsy, and might require a little education; but it should make field men more pressure-minded, and would make calculations in drilling-fluid control much simpler. The numerical relation of different units is shown in Figure 1. Instead of reporting that a mud weighs 10.0 pounds per gallon, or 75.0 pounds per cubic foot, we would report a density of 52. The calculated hydrostatic head in the bottom of a 6000-foot well full of this fluid would be 60 times 52, or 3120 pounds per square inch.

Viscosity of Drilling Muds

One of the most important properties of a drilling mud which should be controlled is its viscosity, being best defined when applied to drilling mud as that property which determines its rate of flow under specified conditions. Since some muds are thixotropic, and practically all muds have the ability to form gels, any viscosity unit which is applied is meaningless unless the conditions of measurement are carefully controlled and definitely stated.[7]

A very good discussion of the meaning and measurement of viscosity of drilling muds is found in Vol. XXXII of the *Transactions of the Mining and Geological Institute of India,* and this publication is recommended to those who wish to go more into detail on this subject than it is possible to do in a limited discussion of this kind.

The viscosity of drilling mud, to a large extent, controls the rate at which it can be circulated. This is very important in relation to the drilling rate. The settling of sand and cuttings, as well as the release of gas, may be governed by the viscosity of the mud. The gel rate and strength of the mud also affect the settling rate of the cuttings and liberation of gas from the mud; but, in general, it is impossible to change these properties without changing the apparent viscosity. It is indeed regrettable that in our viscosity measurements we are unable to eliminate the gelation effects; thus the term "apparent viscosity." It is also necessary to control the viscosity of muds while porous formations are exposed into which returns could be lost. In wells where a mud of high density is required, there is a tendency to lose mud into porous formations which would not take mud at normal pressures. The latter condition often taxes the ingenuity of the operator; for in these wells it is desirable to have a low viscosity

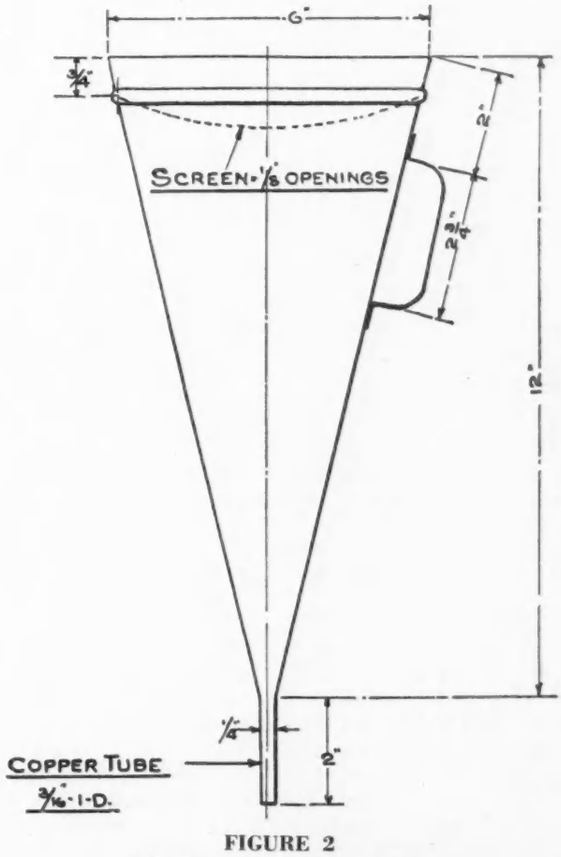

FIGURE 2
Marsh Funnel Viscosimeter.

for the release of gas and to minimize circulating pressures and, paradoxically, to have a high viscosity to prevent the loss of returns.

Numerous viscosimeters have been adopted from other industries, as well as developed by workers in the petroleum industry, for measuring the viscosity of mud.[8, 9] The concentric-cylinder types and the capillary-tube types are most suitable for mud work, and the form adopted depends upon the nature and use of the information required. In laboratory research work it is believed that the concentric-cylinder instrument and, most specifically, the Storm-

er viscosimeter, are more suitable. In field control work, the capillary-tube and, specifically, the "Marsh-type" funnel, have proved satisfactory.

In using the Stormer viscosimeter, the reading at 600 r.p.m. has been discussed by Loomis, Ambrose, and Kennedy; and most operators use this speed as the standard when reporting their data.[10] However, as has been pointed out by many authors discussing the subject of viscosity, the viscosity differences be-

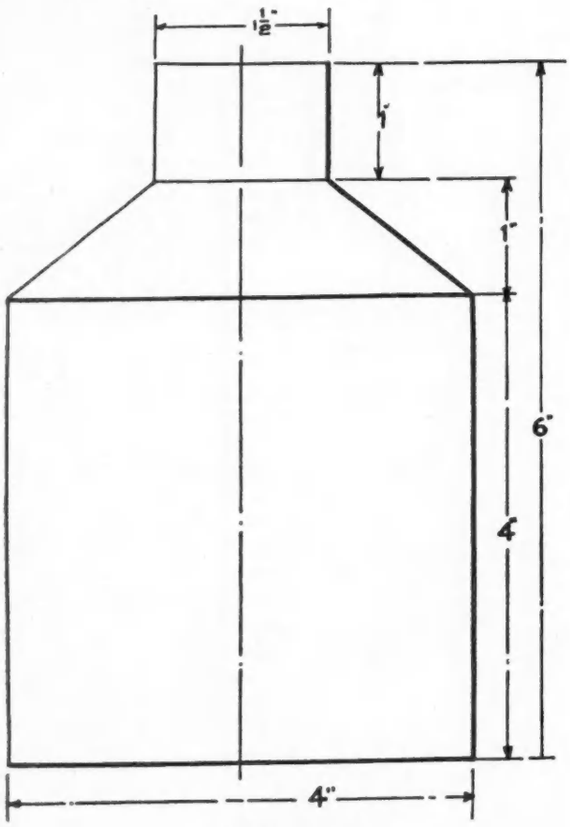

FIGURE 3
Receiver for Marsh Funnel.

tween different drilling muds are minimized at high rates of shear. A true picture of the viscosity changes and the differences in two muds can only be obtained with the Stormer viscosimeter by measuring the viscosity at several rates of shear and plotting a curve between viscosity and shearing rate. By extrapolating this curve to the driving-force axis, a "yield value" is obtained.[11] If an attempt is made to measure the "yield value" by adding weight until the inner spindle moves, a different value is obtained. This would be expected, however, since the conditions of measurement are different, and both values may be taken as correct if the conditions of measurement are stated. Other types of concentric-cylinder viscosimeters have been used, in most of which the outer cylinder is rotated at a known rate and the deflection of the inner cylinder, which is usually suspended by a torsion wire, is measured. This type of instrument has not been widely used by the industry. However, its use is becoming more prominent; and, in cases where it is desired to measure changes in viscosity due to long periods of agitation, an instrument of this type is desirable.

The capillary-tube viscosimeters can be divided into two general types: 1, those which do not require any external pressure; and, 2, those which do require an external pressure. The capillary instrument which has been most widely used in the Marsh funnel-type viscosimeter which does not require any external pressure. Several articles have been published on the viscosity of muds as measured with the capillary tube or orifice on which an external pressure was applied.[12] However, as far as is known, its use has been limited to the laboratory, and the data were not as satisfactory as those which can be obtained with other types of instruments.

A sketch of the Marsh-type funnel viscosimeter is shown in Figures 2 and 3. This viscosimeter is being used at most drilling operations in this country where any attention is being given to mud control. The operators have been able to agree on the dimensions of the funnel. However, the method of testing varies in different localities, and in many cases from well to well in the same locality. Some operators prefer to fill the funnel and check the time required for all of the mud to run out, or until it starts dripping; some operators measure the time for 1000 cc. to run from a full funnel; some allow only 500 cc. to run from a full funnel; while others place only 500 cc. in the funnel and measure the time required for the 500 cc. to run out. Any one of these methods will show changes which might take place in a given mud from day to day, provided the procedure for running the test is consistently the same.

In the Gulf Coast area, it is standard practice to fill the funnel level with the screen, and measure the time required for the discharge of 1000 cc. In the California area the receiving cup full of mud is dumped into the funnel, and the time is measured until the stream from the funnel changes to a drip. In comparing the two methods on two samples of Gulf Coast mud, the data in Table 1 were obtained. Mud No. 1 was a natural mud considered to be in good condition with a low viscosity, and mud No. 2 had a relatively high viscosity. By studying these data it is obvious that the same reading might be obtained for the apparent viscosity of two different viscosity muds by using the California method. This is possible in that the California method inadvertently includes in its viscosity determination much more of the effect of the gelling properties than is included by the Gulf Coast method. The Gulf Coast, or "full-funnel," method has been proved satisfactory by long continued use on all types of drilling fluids.

TABLE 1

Mud No. 1:
Viscosity—full funnel, drained to drip point.
Run No. 1—80 sec. to drip point.
Run No. 2—86 sec. to drip point.
Run No. 3—87 sec. to drip point.
Viscosity—full funnel, 1000 cc. efflux.
Run No. 1—34 sec., 1000 cc. efflux.
Run No. 2—34 sec., 1000 cc. efflux.
Run No. 3—35 sec., 1000 cc. efflux.

Mud No. 2:
Viscosity—full funnel, drained to drip point.
Run No. 1—105 sec. to drip point; dripped for 25 sec., 40 cc. of mud remained in funnel.
Run No. 2—85 sec. to drip point; dripped for 50 sec., 65 cc. of mud remained in funnel.
Viscosity—full funnel, 1000 cc. efflux.
Run No. 1—41 sec., 1000 cc. efflux.
Run No. 2—41 sec., 1000 cc. efflux.
Run No. 3—41 sec., 1000 cc. efflux.

When this same analysis was applied to California

TABLE 2

A Comparison of the Present and Proposed Methods of Using the Viscosimeter.

MATERIAL	CONDITION	California Practice		Proposed A.P.I. Practice	
		Viscosity	Average Viscosity	Viscosity	Average Viscosity
"A" (Gelling)	Thick	.... 77.8	....	35.2 36.2	....
	Just stirred	78.8 79.2	78.6	36.5 36.2	36.0 ....
	Thick	105	....	62.5	....
	Stirred and allowed to stand 2 minutes in funnel	105 103	104.3	65.0	63.7 ....
	Thin	34.8	....	22.0	....
	Just stirred	33.9 34.3 33.2	34.0	22.0 22.0 22.2	22.0 ....
	Thinner	29.4	....	20.1	....
	Just stirred	28.8	29.1	20.4 20.6	20.4 ....
	Fairly-thick	 84	....	35.0 41.2	....
	Stirred	83 85	84	36.5 39.1	37.9 ....
"M" (Non-gelling)	Thin	30.8	....	18.5	....
	Stirred	30.7 31.2	30.9	20.0 19.5	19.3 ....

muds, the data presented in Table 2 were obtained. It will be noticed that the drip-point method gave the most consistent results. It is evident, however, that the muds were of an entirely different type from those used in Gulf Coast operations, as the heaviest muds used in the Gulf Coast of the non-gelling type will not give readings of 19-22 seconds when 1000 cc. is allowed to flow from a full funnel, having dimensions as shown in Figure 1. Where the "full-funnel" procedure is not used, the reduction in head results in a larger effect of gelation on the apparent viscosity. This is not desirable in a viscosity determination of this type, and attempts should be made to determine gelation separately.

In determining viscosities, it is considered good practice to make a second determination for evaluating the gelling characteristics of the mud, and this test will be discussed later. By following such a procedure a practical, yet simple, continuous correlation of these properties is possible.

Oftentimes viscosity data are used in reports and discussions, and only the time required is stated without mentioning the procedure used. This leads to confusion. For example, referring again to Table 2, when the statement is made that a mud had a viscosity of 34.8 seconds, it could be the thin mud, just stirred under "A," or possibly the thick mud. In an attempt to clear up confusion of this kind, the drilling-practice committee has proposed standard mud tests and nomenclature; and, in dealing with viscosity as determined with a Marsh-type funnel, it has been proposed to use a full funnel and measure the time required for the discharge of 1000 cc. There is a strong sentiment in the committee in favor of the procedure described as the Gulf Coast or "full-funnel" method.

Sand Content

Sand and fine cuttings carried by drilling fluids are abrasives, and in most cases the problem is merely one of keeping the sand content as low as possible. It is not generally accepted that there is a need for determining the fineness of the suspended sand. There has been little work done on the economic value of sand-free muds, but it is believed that methods used in the past for determining sand contents are satisfactory for any future studies. These methods fall into two classes, viz.: elutriation or classification; and settling, either solely by gravity or by aid of centrifugal force. Either method is suitable for field use, and neither is considered so superior that the other should be excluded from a standard code. Preference has been shown for the classification method (equipment shown in Figure 4). The sample of mud is diluted and washed in such a way as to remove all colloidal and very-fine material from the test tube, and to allow a reading of the amount of sand remaining. In the centrifuge method a sample of mud is diluted with water, and the sand centrifuged to the bottom of the tube.

Gelation—Gel Strength and Gel Rate

The control of the gelation properties of a mud is almost as important as viscosity control. In some cases it is desirable to use muds which develop strong gels, and in other cases muds whose gel properties are very weak are desirable. The suspension of heavy weighting material depends more on the gel properties of the mud than upon the viscosity. Likewise, sand and cuttings can be removed from the mud by lowering the gel properties without materially affecting the viscosity. The release of gas depends a great deal upon the gel characteristics of the mud. Also the ability to cement long strings of casing depends upon controlling the gel strength of the mud.

In dealing with gelation, the strength as well as the gel rate must be considered; and, as viscosity units are meaningless unless the conditions of measurement are expressed, so are any units applied to gelation unless they are coupled with a time factor. In many cases, the initial gel strength, or "yield value," is measured by extrapolating the rate of shear or rate of flow versus pressure curve to its

point of interception with the pressure axis. The value obtained is being considered by some as an inherent property of the mud. However, such is not the case, as it depends almost entirely on the past history of the mud.

The "yield value" is sometimes evaluated by measuring the pressure (in the case of the pressure-type viscosimeters) or the force, where concentric-

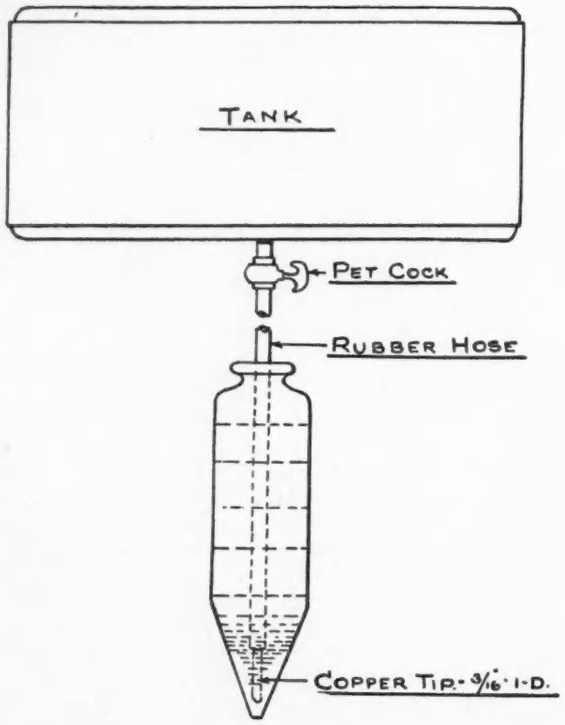

FIGURE 4
Classification Apparatus.

cylinder viscosimeters are being used—which is just enough pressure or force to start flow or to start one of the cylinders rotating. The values obtained are different in most cases from those obtained by extrapolation, usually being considerably higher and more representative of the conditions existing in the well.

The gel properties of a mud have also been measured by means of a duNouy surface-tension apparatus. The ring is immersed in the mud, and the force required to move the ring is determined. When this force is plotted against the time that the ring was allowed to remain undisturbed in the mud, a curve similar to that shown by Figure 5 is obtained. It has been possible to establish a relation between this force and the amount of "swabbing" or pressure reduction which occurs when the drill pipe is withdrawn from the hole. It is believed that more accurate results are obtained when using a small screen, suspended vertically in the mud, instead of the platinum ring.

In field or control work, the tendency has been to use one viscosity measurement for determining the various properties of the mud. These single tests, of course, are indicative of changes in the general nature of a given type of mud; and, with very little experience, the driller is able to determine if the apparent viscosity of the mud is changing. Since the funnel viscosimeter is used in making this determination, tests have been devised whereby the operator is able to determine changes in the gelation of the mud with the same instrument. In doing this, at least two viscosity determinations are made: the first as soon as the funnel can be filled, and the second after the funnel has been filled and is allowed to remain undisturbed for a measured interval of time. The difference in the two readings is related to the gel properties of the mud, and within a very short time in a well or field where the type of mud is not radically changed it is possible to establish the desirable limit between the two readings.

Hydrogen-ion Determination

In some cases it is desirable to study the acidity or alkalinity of the drilling fluid in the field as well as in the laboratory. The hydrogen-ion concentration has been determined by colorimetric and electrometric methods, and the results expressed as the pH value of the drilling fluid. A colorimetric method, employing gelation strips impregnated with suitable indicators, is believed to be most adaptable for field use, and is as accurate as any method.[13] However, some operators prefer to use electrometric methods. A number of glass electrode instruments is available that are of durable construction, considering the nature of the equipment, and are easily operated. Regardless of the method used, it should be checked against known standards.

The following tentative code was approved in principle, subject to changes after field use, by the Committee on Drilling Practice at its Chicago meeting, November 1936:

TENTATIVE STANDARD CODE FOR TESTING DRILLING FLUIDS

I. DENSITY OF DRILLING FLUID

1. Instruments

a. An aluminum mud hydrometer with bakelite cup shall be used (design as shown in Figure 1). The cylinder containing water in which the instrument is immersed shall follow conventional design now in use.

b. The stem and body of the hydrometer shall be hollow, with a small screw in the top of the stem to allow for adding or removing shot when calibrating.

c. The hydrometer shall be calibrated to read in hydrostatic pressure, in pounds per square inch, exerted per 100 feet of mud column (Figure 1).

2. Procedure

a. The bakelite cup shall be filled with the mud under examination to the level of the edge; the top shall be inserted gently, and lugs engaged. Excess mud shall be washed or wiped off, the cup placed on hydrometer clip, and cup and hydrometer immersed in clean water at a temperature of approximately 70° F. in the cylinder.

b. The reading shall be taken at the surface of the water in the cylinder.

c. The reading shall be reported to the nearest half-pound per square inch.

d. Aluminum hydrometer and bakelite cup shall be kept free of grease and dirt.

e. The hydrometer shall be calibrated at least once a day, using fresh water at a temperature of approximately 70° F. in the cup.

(NOTE: Variations in temperature of the water affect the readings, and an effort should be made to maintain the temperature of the water in which the hydrometer is suspended to within 10° F. of the temperature at the time of calibration.)

II. VISCOSITY OF DRILLING FLUID

1. Instruments

a. The Marsh funnel shall be used for the determination of viscosity of drilling fluids.

b. The funnel shall be made of galvanized iron, of conical shape, 6 inches in diameter at the top, and 12 inches high (see Figure 2). A 2-inch copper tube, 3/16-inch in

Nervous hoofs splinter 3-inch planks but can't cut rubber

A typical example of Goodrich product development

RACE horses are expensive to own as well as to follow. An Ohio owner, not willing to trust his favorites to ordinary transportation, had a special motor van built. But the floor, even when made of 3-inch oak planks, was cut to splinters by the pawing hoofs of the high-strung animals. Matting was tried, but showed no improvement.

The owner had heard of the unusual things Goodrich had done with rubber, and he came here. Goodrich engineers had exactly what he needed—Armorite—a special rubber developed by Goodrich to stand sharp abrasive wear, and used to line gravel chutes, ball mills, sand pipe, cyclone collectors.

A sheet of this Goodrich rubber, one-half inch thick, was laid on the floor of the van, and the most nervous horse in the stable can't cut it. Incidentally, Goodrich suggested the sides of the van be lined with sponge rubber, and the owner says his horses now win more races because they no longer are bruised by jarring travel.

Goodrich engineers are constantly solving problems just as unusual as this, and often more difficult. These men are working closely and constantly with practically every industry, developing new usefulness for rubber in its thousands of forms, and employing their long, specialized experience to make every Goodrich product a better value for the buyer. The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

Goodrich

ALL *products problems* IN RUBBER

inside diameter, shall be so soldered into the bottom of the funnel that no constriction is obtained at the joint.

c. A wire screen with ⅛-inch openings shall be fixed ¾-inch below the top of the funnel.

d. A suitable handle shall be fixed to the funnel.

e. The receiver shall be of 1000 cc. capacity, and shall conform to the general shape shown in Figure 3.

2. Procedure

a. The funnel shall be filled to the top of the screen with the mud under examination. Flow of the fluid through the orifice is prevented at this point by the operator holding his finger over the opening.

b. The mud shall be allowed to flow into the receiver, and time in seconds determined from the instant flow begins until the instant mud fills receiver to the top.

c. The time elapsed from taking of the mud sample to start of determination shall be as short as is possible.

d. Results obtained shall be reported in seconds.

(NOTE: The funnel and receiver shall be kept clean and protected from abuse. If the efflux tube becomes damaged in any way, it should be replaced.)

III. SAND CONTENT

A. Classification Method

1. Instruments

a. The sedimentation tube shall be an oil centrifuge tube, of 100 cc. capacity, ASTM serial D-96-35, having parallel sides with tapered bottom, graduated in accordance with ASTM standards.

b. The washing tube shall be of rubber, of a convenient size, and shall be equipped with a ⅛-inch copper tube.

c. The water reservoir shall be of at least 2-gallon capacity, and shall be fitted with a brass petcock to take the rubber washing tube.

d. The apparatus shall be mounted securely so that the water reservoir is 2 feet to 3 feet above the top of the sedimentation tube, which should be fixed in position by means of suitable clamps.

2. Procedure

a. The mud sample shall be poured into the sedimentation tube to the 20-cc. mark; clear water shall then be added to bring the total volume to 100 cc.

b. The sedimentation tube shall be clamped into place, and the copper tip of the washing tube inserted almost to the bottom of the tube.

c. Water from the reservoir shall be run into the tube at a rate of approximately 300 cc. per minute, and allowed to overflow over the top until there remains only sand in the tube and all turbidity has disappeared.

e. The volume of sand remaining shall be read, and the reading multiplied by 5 to give percent by volume of sand in the drilling fluid.

B. Centrifugal Method

1. Instruments

a. A centrifuge of the type as designated in the *API Code No. 25* for determining water and sediment content of oil, accommodating two 100-cc. pear-shaped glass centrifuge tubes, shall be used for the determination of sand in drilling fluids.

2. Procedure

a. Mud shall be poured into two centrifuge tubes to the 50-cc. mark in each; water shall be added to bring the total volume in each tube to 100 cc. The contents of each shall be mixed, and the tubes inserted in the centrifuge. The tubes shall be rotated at a rate of 70 to 80 r.p.m for 2 minutes to 3 minutes.

(NOTE: Discrimination between sand and fine silt shall be made, and volume of sand only noted; the presence of high-specific-gravity weighting materials vitiates the test.)

b. Per cent sand by volume shall be reported; this value shall be obtained by multiplication of the sand volumes obtained by 2, and calculation of the average of the duplicate determinations.

IV. GEL STRENGTH AND GEL RATE

1. Instruments

a. Same as Par. *a* under "viscosity."

2. Procedure

a. Make viscosity determination as described in Par. *b* under "viscosity."

b. Make a second viscosity determination with the exception that, after filling the funnel, the mud should be allowed to remain undisturbed for 5 minutes before the efflux is started.

c. The difference in the results of the two tests, expressed in seconds, is related to the gelling properties of the mud.

(NOTE: The difference in the results of the two tests is a function of the gel rate and gel strength.)

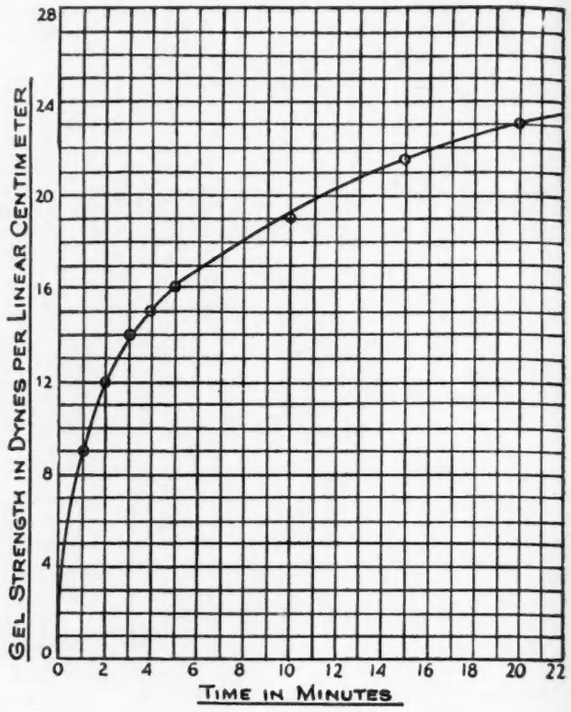

FIGURE 5
Typical Gulf Coast mud. Gelation vs. Time Curve.

V. HYDROGEN-ION DETERMINATION

A. Colorimetric Method

1. Instruments

a. Gelation strips impregnated with indicators, covering a range of pH from 6.0 to 13.0, shall be used for the determination; the changes in color or color intensity over the range of each indicator shall be sufficient to allow the operator to read to 0.1 pH unit.

b. Color standards shall be mounted on slides of a convenient size, with the standards labeled legibly.

2. Procedure

a. An indicator strip, which the operator adjudges to include the pH of the mud under examination, shall be immersed in the mud for 1 minute, withdrawn, wiped off carefully, and the developed color compared with those on the proper standard slide.

b. If the pH does not fall within the range of the indicator strip used, the determination shall be run again, using the proper strip.

B. Electrometric Method

(NOTE: Some of the glass electrode instruments commonly used for pH determinations are satisfactory, provided they are of durable construction and combine simplicity of operation with a minimum of attention to maintenance. Instructions supplied with these instruments detail procedure and proper care.)

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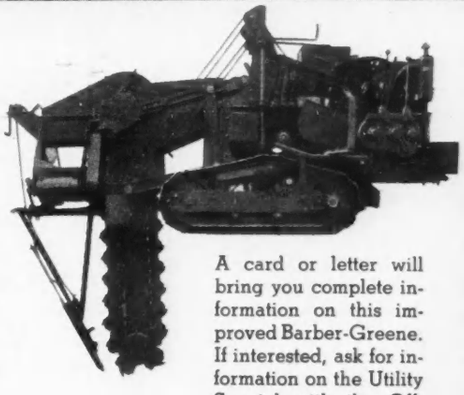

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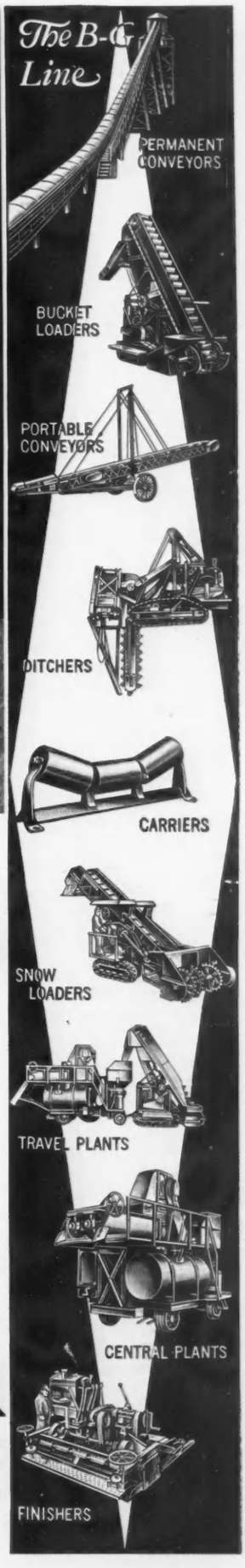

Pressure Maintenance and Unitization

SOUTH BURBANK POOL

By I. S. SALNIKOV and M. L. HAIDER
The Carter Oil Company

THE South Burbank Pool, located in East Osage County, is in the North-South trend between the old Burbank and the Fairfax Pools. It comprises approximately 4,000 productive acres, of which 2,720 acres were unitized June 1, 1935. Unitization was effected by determining the reserves under each tract, the percent of participation in the unit being in the proportion that the reserves of each tract bears to the total reserves of the unitized area. The purposes of unitization were: 1, to carry out a pressure-maintenance program by returning gas to the formation and thus prolong flowing life and increase ultimate recovery; and, 2, to effect economies in the development and exploitation of the properties. The unitized area is currently returning approximately 16,000 MCF of gas per day to the reservoir, which is equivalent to 1,640 cubic feet per barrel of oil produced; the outside operators are collectively returning 2,220 MCF of gas per day, which is equivalent to 414 cubic feet per barrel of oil produced. Data obtained to date indicate a reduction in the rate of reservoir-pressure decline due to the gas injection. Preliminary work indicates that the gas-oil ratio can be controlled by the use of packers, which are discussed in the paper.

This paper was presented at Seventh Mid-Year Meeting, American Petroleum Institute, at the Broadmoor Hotel, Colorado Springs, Colo., June 2, 1937. The statements and opinions expressed herein are those of the authors, and should not be construed as an official action or opinion of the Institute or of this journal.

THE South Burbank pool is located in eastern Osage County, Oklahoma, in Townships 25 and 26 north, and Range 6 east. In relation to the old Burbank field, it is on the north-south trend of the oil-bearing Burbank sand between the old North Burbank and the Fairfax pools.

The pool was discovered by Mead DeNoya Well No. 1 drilled by the Mead Brothers in January 1934, in the northeast of southwest of Section 10-25-6, with an initial production of 1647 barrels from 49 feet of soft, brown and well-saturated Burbank sand.

Structurally, the South Burbank pool[1] is very similar to other pools producing from the Burbank sand bodies occurring elsewhere in Oklahoma and Kansas.[2] These sands generally occur in trends consisting of lenses of sand separated by shale breaks. They are early Pennsylvanian deposits, and are thought to be offshore sand bars on the western coast of the Cherokee Sea. The sand interval in the pool is approximately 80 feet thick, of which 40 to 60 feet are usually saturated pay. The sand zone is interbedded with shale and silty sandstone. Core data are very meager, but the limited data available indicate 17 percent mean sand porosity and variable permeability of approximately 50 millidarcys. Depending on porous sand thickness and permeability, the initial production of wells in the pool varies from 50 to 5800 barrels. The average depth of the wells is approximately 2850 feet, and the total productive acreage of the pool is approximately 4000 acres. In general, the wells are drilled on a staggered 10-acre pattern, the spacing averaging approximately 16 acres per well. A map of the pool is shown in Figure 1.

Early Unit Agreement

Low development cost and expected good recoveries immediately created a great deal of interest in the area, and in its first stages of development the South Burbank pool gave signs of a booming oil field with the attendant wasteful competitive methods so well known to the petroleum industry elsewhere. The old urge to "get the oil regardless of cost and waste" was soon broken, however, by mutual agreement of the majority of operators to communitize their acreage and develop and produce it in a sane efficient manner. Thus 16 different property owners merged their interests, and created the South Burbank Unit comprising a total of 2720 acres. The percentage participation of each owner was determined by the relationship which the recoverable reserves under his acreage bore to the total recoverable reserves of all the acreage included in the unit. The reserves of each tract were determined from a relationship whch was found to exist in the old Burbank pool between initial production and ultimate recovery. It was found that the ultimate recovery per acre was proportional to the square root of the initial production. Since the characteristics of the old Burbank pool are quite similar to those of the South Burbank pool, application of this relationship yielded a reasonable estimate of the reserves. Accordingly, the average initial production of each tract was determined from an initial-production contour map, and the recovery per acre read from the square-root curve. The percentage thus determined is final, and cannot be changed except by admission of additional acreage.

The unit began to function June 1, 1935 under the

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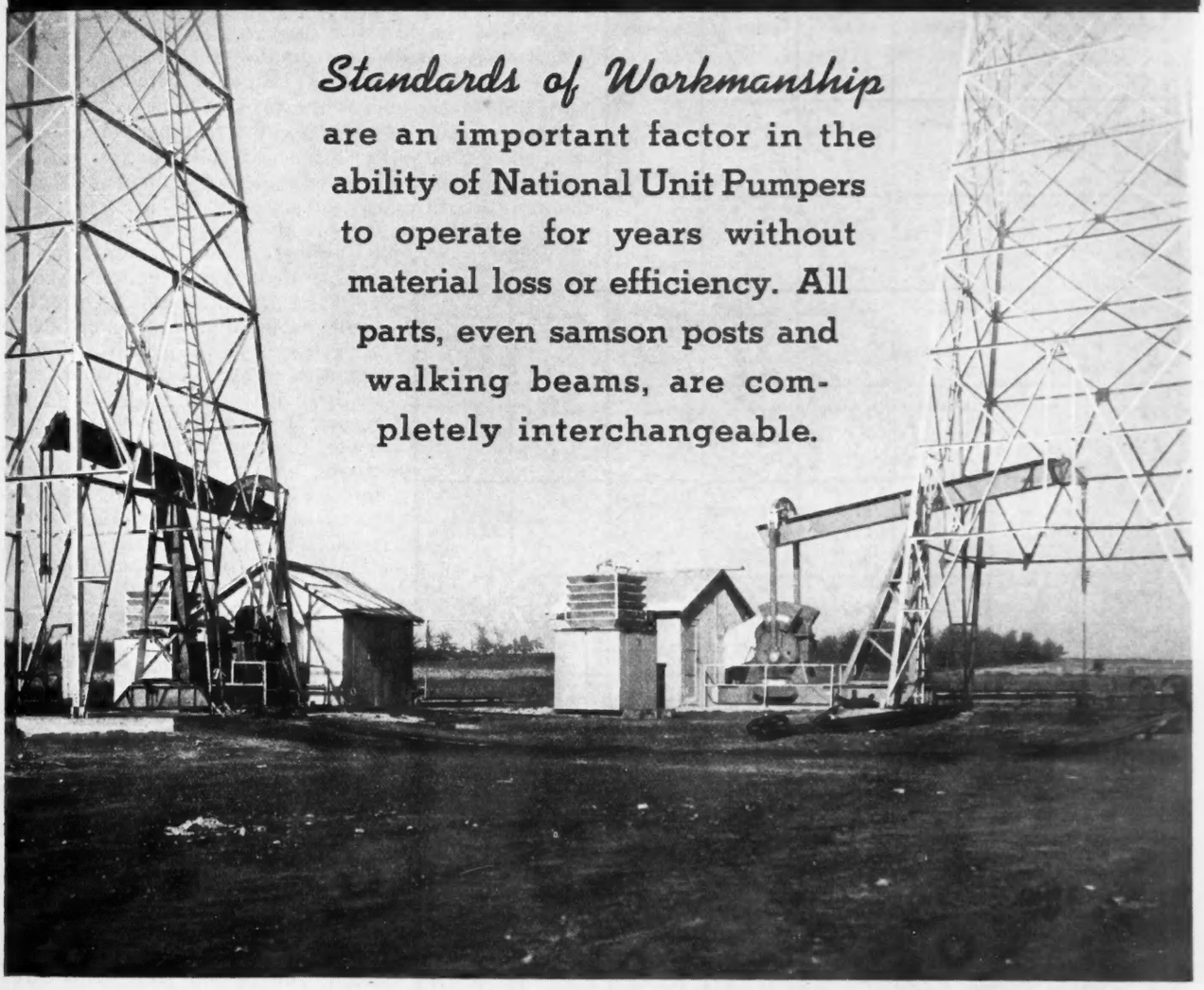

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supervision of The Carter Oil Company, selected by election as the operating company. All major problems are referred to a governing advisory committee, which is composed of one representative from each participant in the unit. Problems of a technical nature are referred to an engineering committee working under the jurisdiction of the advisory committee.

Purposes of Unitizing Pool

The purposes of unitization were: 1, to carry out a pressure-maintenance program by returning gas to the formation and thus prolong the flowing life of the wells and increase ultimate recovery; and, 2, to effect economies in the development and exploitation of the property. Wider well spacing, reduced material inventories, minimized overhead and labor costs, and standardization of equipment are indirect benefits derived from both the consolidation of properties under one management and the pressure-maintenance program.

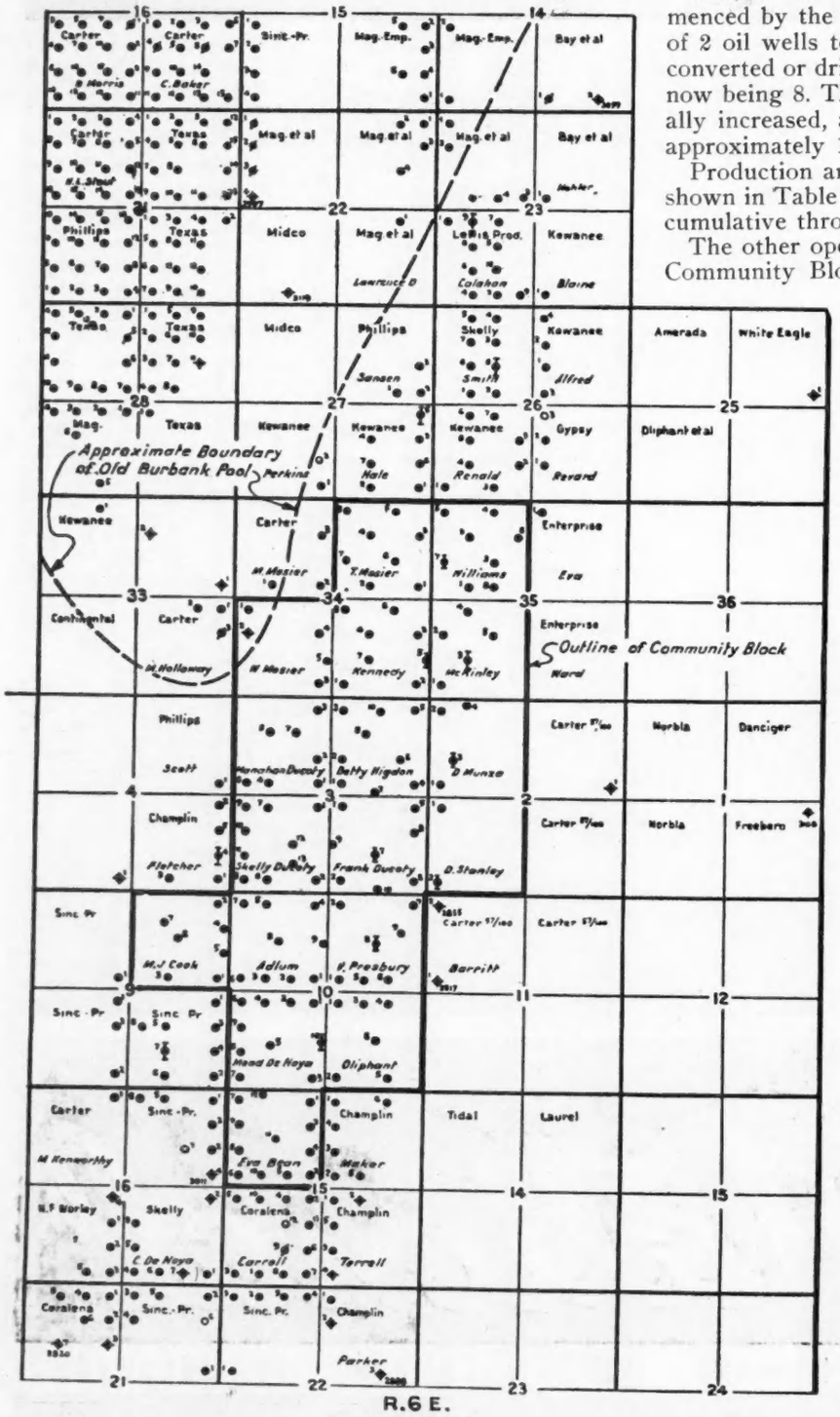

FIGURE 1
South Burbank Pool

Gas Injection

Actual return of gas to the reservoir was commenced by the unit on June 21, 1935, by conversion of 2 oil wells to input duty. Other wells were later converted or drilled for input wells, the total number now being 8. The volume of gas injected has gradually increased, and at the present time is averaging approximately 16,000,000 cubic feet per day.

Production and gas-injection data for the unit are shown in Table 1 for the month of January 1937, and cumulative through January.

The other operators in the pool soon followed the Community Block in the program by initiating an independent gas-injection system. In April, 1936, Champlin Oil & Refining Company, the owner of two edge leases in the south and west portions of the pool, converted two of their producing oil wells for the return of gas with one well for each lease. They soon, however, discontinued gas injection on one lease, but are continuing on the lease located on the western edge of the pool at the very nominal daily rate of 150,000 cubic feet per day. Sinclair Prairie Oil & Gas Company, operating three leases in one block on the southwest edge of the pool, joined the program in October, 1936, by conversion of two of their well for gas-input purposes. This company is now returning an average of 25,500,000 cubic feet per month, or approximately 480 cubic feet per barrel of oil produced. Kewanee Oil & Gas Company, Skelly Oil Company, and Lewis Production Company, who are the operators of the rich narrow strip in the north end of the pool, by agreement among themselves are pressuring the north end of the pool, with three input wells. In this area approximately 39,142,000 cubic feet monthly are returned to the pool reservoir, or in the neighborhood of 438 cubic feet per barrel of crude oil produced from their properties. With every major operator in the pool being definitely committed to the pressure-maintenance program, the South Burbank pool operations for January, 1937, are shown in Table 2.

Production practice of the Unit Block is to produce the wells at the rate commensurate with the most efficient gas production, thus causing a minimum withdrawal of

TABLE 1

Production and Gas-Injection Data

	Daily Average	Monthly Total	Accumulated Total
Gross fluid—barrels produced	9,807	304,011	.....
Gross oil produced, barrels	9,785	303,325	9,014,769
Gas produced, 1,000 cu. ft.	17,997	557,822	9,429,166
Gas injected, 1,000 cu. ft.	16,050	496,904	4,930,539
Produced gas injected, percent	.....	89	52
Produced gas-oil ratio	.....	1,839	1,046
Injected gas-oil ratio	.....	1,639	547
Net gas-oil ratio	.....	200	499
Average injection pressure, lb., per sq. in.	.....	880	.....
No. of producing days	.....	31	.....
No. of input wells	.....	8	.....
No. of oil wells	.....	115	.....

Note: Accumulated oil and gas production calculated from first recovery Accumulated gas injection calculated from June 21, 1935.

TABLE 2

South Burbank Pressure-Maintenance Data, January 1937

No. of Oil Wells		Monthly Crude-Oil Production (Barrels)	Injected Gas Volume (Cubic Feet Per Month)	Injected Gas Volume (Cubic Feet Per Barrel)
114	Community Block 42	302,727	496,940,000	1,640
7	Skelly Oil Co.	27,340	20,324,000	743
20	Kewanee Oil and Gas Co.	45,515	4,402,000	97
16	Sinclair Prairie Oil Co.	54,022	25,878,000	479
9	Lewis Production Co.	18,759	14,416,000	768
13	Champlin Oil & Refining Co.	20,516	3,847,000	187

TABLE 3

Pressure-Maintenance Data, by Months, for 1936

Month	Oil Production (Barrels)	Weighted Average Gas-Oil Ratio (Cu. Ft. Per Bbl.)	Monthly Volume of Gas Injected (1,000 Cu. Ft.)	Accumulated Gas Injected (1,000 Cu. Ft.)	Produced Gas Returned to Reservoir (Percent)
Jan.	258,516	1,158	202,086	787,833	64
Feb.	264,593	1,195	198,379	986,212	63
March	330,435	1,219	233,320	1,219,532	58
April	360,338	1,243	235,918	1,455,450	53
May	352,565	1,300	252,439	1,707,889	55
June	302,653	1,375	262,289	1,970,178	66
July	297,938	1,463	373,972	2,344,150	86
August	301,361	1,568	396,919	2,741,069	84
Sept.	292,273	1,718	438,853	3,179,922	87
Oct.	305,940	1,850	453,434	3,633,356	80
Nov.	256,698	1,912	412,299	4,045,655	84
Dec.	304,815	1,905	453,768	4,499,423	78

TABLE 4

Cumulative Oil Production, Sub-surface Pressures, and Pressure Decline

DATE	Sub-surface Pressure —1,750 (Lb. Per Sq. In.)	Accumulated Crude-Oil Production (Barrels)	Average Sub-surface Pressure Decline (Per 1,000,000 Bbl. Produced)
CARTER OIL COMPANY			
April.....1934	1,083	.....	..
September.....1934	1,023	498,886	..
November.....1934	1,011	776,324	..
April.....1935	963	1,282,668	..
COMMUNITY UNIT			
June.....1935	897	3,531,592	..
August.....1935	883	4,070,485	..
October.....1935	876	4,556,146	..
December.....1935	867	5,083,318	..
May.....1936	829	6,365,000	31
August.....1936	794	7,460,000	30
November.....1936	778	8,300,000	19

gas from the reservoir. High gas-oil ratio wells are shut in until the cause of the high rate of gas production can be corrected. This production practice is made possible by the unit agreement among the operators, and by a special permit of the Indian Agency of the Department of the Interior granting a blanket lease to the 2720 acres embraced in the unit and abolishing all former internal property lines from the standpoint of royalty. Production is largely by natural flow, only 1.56 percent of the unit's production for January having been produced by sucker-rod pumping.

The wet gas from separators in the field is metered by groups of wells and delivered to the gasoline plants. The gas remaining after extraction of gasoline and fuel requirements is returned to the injection plant at an average pressure of approximately 275 pounds, and discharged into the input lines at an average pressure of approximately 1000 pounds. The injection gas is metered both at the intake to the pressure plant and at each input well.

The monthly production of oil, gas-oil ratio, monthly and cumulative gas injected, and percent of produced gas returned to the reservoir are shown in Table 3 for the "unit" for 1936. Accumulated production of oil, sub-surface pressures, and pressure declines are shown in Table 4. These data are shown graphically in Figures 2 and 3.

It will be noted that in the period from April, 1934, to October, 935, a period of production without gas injection, there was a decline of 207 pounds in sub-surface pressure for 4,556,146 barrels of oil taken from the reservoir. In the second period, or under the pressure-maintenance program, a withdrawal of 3,843,854 barrels of crude oil has reduced pressure only 98 pounds. Comparing these two periods on the basis of the decline per 1,000,000 barrels of oil produced, the figures for the first and second periods are 45.4 and 25.7 pounds per square inch per 1,000,000 barrels, respectively. The gas injection to the reservoir was initiated on June 21, 1935, and since has been continued to date with returns at times as high as 87 percent of produced gas injected into the reservoir. The low rate of return in April and May of 1936 is attributable to a potential period at which time large volumes of gas were wasted into the air.

Changes in Gas-Oil Ratio

Although the monthly crude-oil production remained at a fairly uniform rate for the entire year, pronounced changes have occurred in gas-oil ratios. The weighted gas-oil ratio for the "unit" properties has increased each successive monthly period from 1160 cubic feet in January to 1900 cubic feet in December of 1936. The step-ladder rise of the "block's" gas-oil ratios, with an increment steadily increasing from May to October, is a possible indication of gas cap spreading from input wells in the direction of oil wells through the permeable sand channels. It is significant, however, that notwithstanding the large gas withdrawals coincident with mounting gas-oil ratios, the reservoir-pressure drop, in pounds per million barrels of crude oil produced, has decreased in corresponding time; thus the drop for the period ending in May was 31 pounds per 1,000,000 barrels; from May to August it was 30 pounds per 1,000,000 barrels, and in the following three months only 19 pounds per 1,000,000 barrels of oil produced. The reverse in drop is partly satisfied by increased deliv-

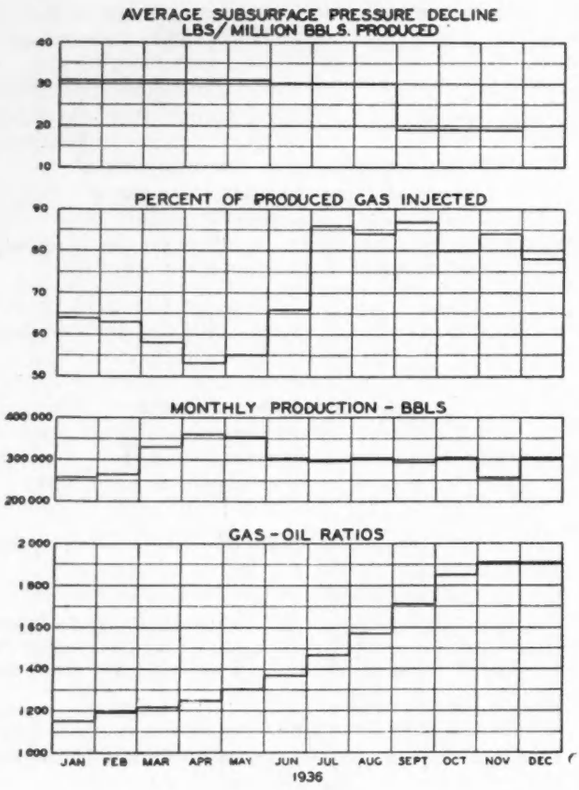

FIGURE 2

eries of gas back to the reservoir. There are possibly other factors that are ancillary to this occurrence which at present are not clear enough to be stated with a certainty.

The spread of the injected gas through formations of the gas-cap area in the eastern edge of the pool, and consequent invasion of the permeable sand streaks of neighboring oil wells, presented a serious threat to an efficient pressure-maintenance program. However, an increased gas production through increased gas-oil ratios was expected in the pool for the two reasons, viz., natural increase in gas ascribable to ordinary producing conditions, and subsequent artificial increase attributable to the pressure-maintenance program. With this in mind, as early as the first half of 1936 the development work was started to find means and equipment to combat the effected increase in the gas-oil ratios. Initially, simple and inexpensive methods only were tried, which in some instances have proved failures and in the others partly successful. Of these, resting of wells, stopcocking, top- and bottom-hole choking, and production through a smaller-diameter tubing were thoroughly investigated. None of these methods, however, were found entirely effective and dependable to retard the rising gas production. In the next series of tests an application of packers to separate an upper gas-bearing section from a lower oil-bearing zone in the same sand reservoir was attempted, and later proved to be a promising method to overcome high gas-oil ratios.

Setting Packers

In the preliminary survey coincident with the use of the formation packers as the next best thing in the control of gas-oil ratios, difficulties were discovered that for a time were considered sufficient to interfere with the use of packers. The formational difficulties, such as the absence or unreliability of any definite zone separating an upper gas section from a lower horizon, have placed a dependence of packer seal either on the absence of the vertical permeability or on the relative difference between the

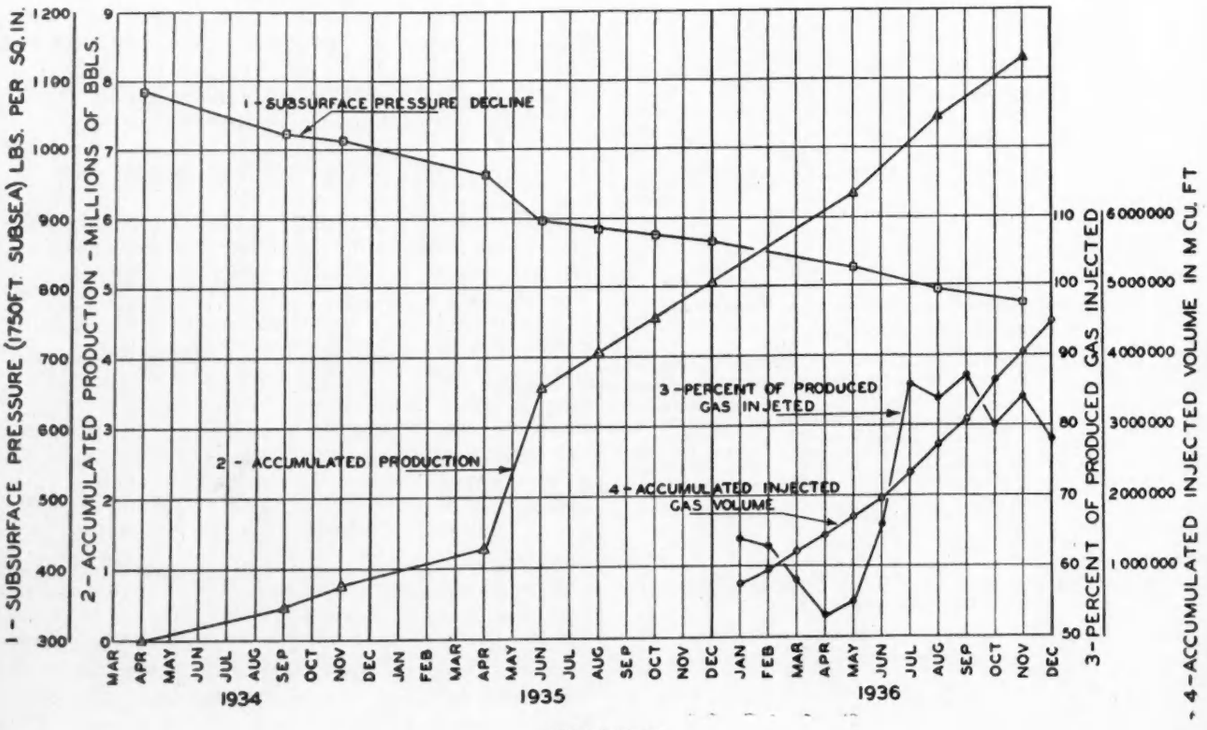
1 - SUBSURFACE PRESSURE (1750FT. SUBSEA) LBS. PER SQ. IN.
2 - ACCUMULATED PRODUCTION - MILLIONS OF BBLS.
3 - PERCENT OF PRODUCED GAS INJECTED
4 - ACCUMULATED INJECTED VOLUME IN M CU. FT
1 - SUBSURFACE PRESSURE DECLINE
2 - ACCUMULATED PRODUCTION
3 - PERCENT OF PRODUCED GAS INJETED
4 - ACCUMULATED INJECTED GAS VOLUME
1934
1935
1936

FIGURE 3
Sub-surface Pressure, Production, and Gas-Injection Data.

vertical and horizontal permeabilities. The knowledge gained from cable-tool core samples that were taken in the pool was only of rudimentary character. This information, however, aided by the observations of cable-tool sand cuttings in the process of drilling, gave some evidence of existence of shaly bedding planes. Drilling has also indicated soft- and hard-sand zones in penetrating through the sand. The unknown location of these shaly bedding planes and hard-sand zones in the well have, however, predicated difficulties in setting packers successfully. At the outset it was realized that to locate these zones for successful packer setting it would be necessary to determine these points experimentally for each individual well. An investigation of available packers on the market disclosed the total absence of packers suitable for the conditions existing in the pool. The hook-wall and a disc-wall packer were considered unsatisfactory for the open-hole service, and the anchor packers require round-trips with the tubing for each re-setting. These difficulties, together with the existing conditions of running packers into flowing wells producing upward to 20,000,000 cubic feet of gas, were tending to condemn these as too expensive methods of controlling gas volumes.

With these factors in view, the engineers set out to develop a successful formation packer which can be set, and subsequently re-set if necessary, without making round-trips with the tubing. The result of this effort was an under-set packer, illustrated in Figure 4, showing both set and re-set positions of the packer. The packer's upper or anchoring mechanism functions on the latching principle of the hook-wall packer—the slips being engaged and disengaged from their located positions by action of a pin on the main body and a hook on the slip carrier. The packer, before it is run into the well, is screwed onto a tubular section, with the setting mechanism attached to the top and packing mechanism to the lower end of the section. The length of this tubular section is dependent upon the thickness of the sand body and a maximum setting depth of the packer.

It is important that setting mechanism remains above the casing shoe at all times in moving packing mechanism up and down the hole when selecting the setting points. The packing element is expanded by vertical compression force exerted through a setting ring. The ring is locked into or released from position on the body by three J-slots, through which protrude three lugs on a heavy collar in the tubing string. In the lower end of the packing mechanism a high-pressure stuffing box is provided which excludes the annular space between the body and the tubing from the open hole below the set packer. The whole assembly is run into the well on tubing and, at a point 12 inches above the predetermined position, rotation of the tubing to the left first brings the setting lugs into line with the body slots and then, upon completion of a one-quarter turn, releases the slip hook in the casing. Lowering the tubing 2 inches is usually sufficient to set the slips between the cone and the casing. After the slips are set, downward travel forces the setting ring down on the packing element to provide the maximum expansion against the walls of the hole. A pick-up and clockwise movement releases both the packing and anchoring assemblies. If it is desired to re-set the packer at a lower point, it is necessary to perform

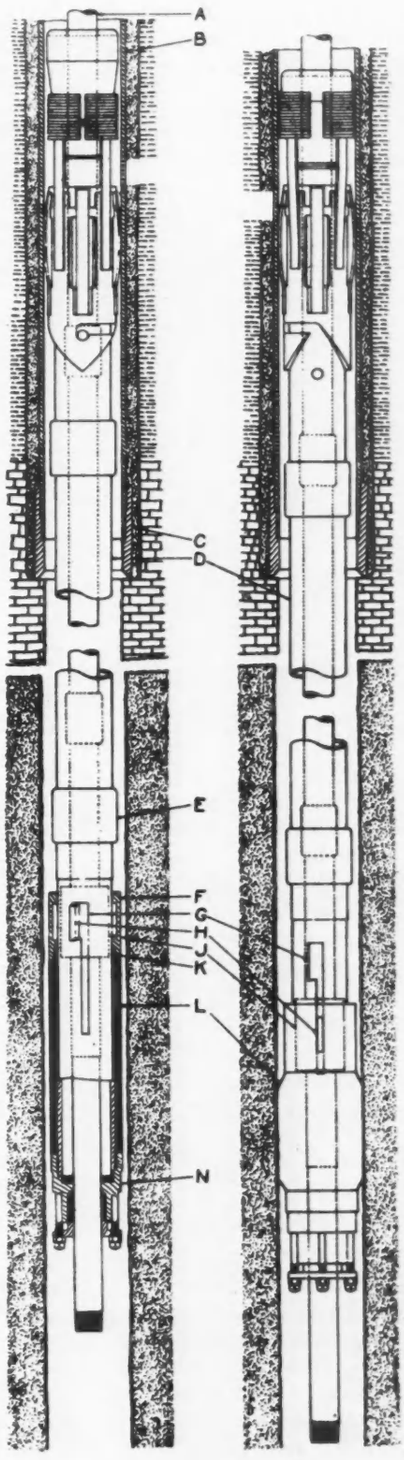

FIGURE 4
Under-Set Formation Packer

this locking operation; on the other hand, to re-set the packer at a higher level there is no need of locking before re-setting.

All under-set packers used in the South Burbank pool employ neo-prene instead of rubber for packing elements. Some of the under-set packers now in service have been re-set as many as four times without pulling tubing—finally securing a sand shut-off of gas. It is early as yet to comment on the relative qualities of rubber and neo-prene in service on the packers. There are a number of flow packers using either neo-prene or rubber performing under similar well conditions, and in time the story of rubber and neo-prene in packer service may be told with certainty.

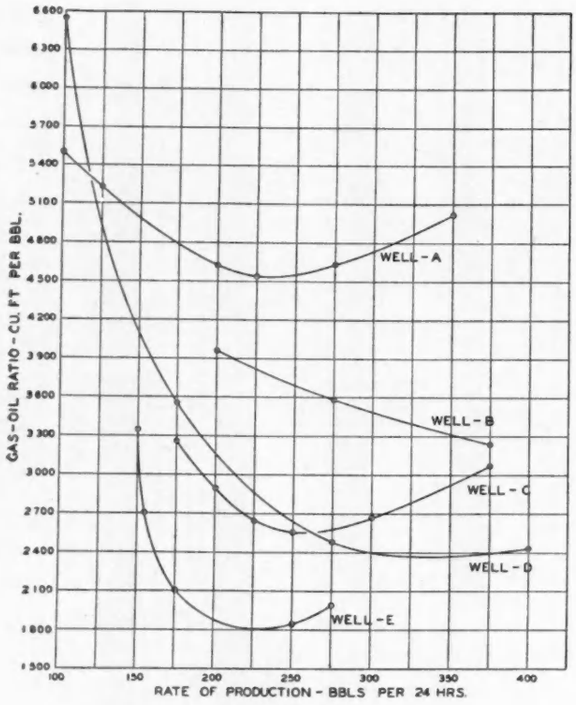

FIGURE 5

Gas-Oil Ratios of Wells Producing From Gas-Cap Area

The relationship of gas and crude-oil production in wells partly invaded by gas in the gas-cap area is illustrated in Figure 5 and Table 5.

Typical Well in Gas Cap

The original reservoir gas-oil ratio in the South Burbank pool was approximately 600 cubic feet per barrel, varying from 400 to as high as 900 cubic feet per barrel under various rates of production. The gas-oil ratios shown for a group of wells supposedly invaded by a gas cap varies from 1800 to 7000 cubic feet per barrel, with other wells in the pool giving gas rates upward to 12,000 cubic feet per barrel. Wells in the gas-cap area usually show a high gas-oil ratio at low rates of production, with the gas-oil ratio decreasing with an increase in the rate of production up to a definite individual rate for each well, at which a minimum gas-oil ratio is obtained. A further increase in the producing rate is usually accompanied by an increase in the gas-oil ratio. The oil

TABLE 5

Crude-Oil Production and Gas-Oil Ratio in Gas-Cap Area

Rate of Oil Production Per 24 Hours (Barrels)	Gas-Oil Ratio (Cubic Feet Per Barrel)				
	Well "A"	Well "B"	Well "C"	Well "D"	Well "E"
100	5,500	.....	.....	6,600	.....
125	5,130	.....	.....	.....	.....
150	.....	.....	.....	.....	3,330
175	.....	.....	3,260	3,575	2,100
200	4,620	3,930	2,900	.....	.....
225	4,530	.....	2,630	.....	.....
250	.....	.....	2,550	.....	1,830
275	4,630	3,580	.....	2,480	2,000
300	.....	.....	2,670	.....	.....
350	4,990	.....	.....	.....	.....
375	.....	3,230	3,070	.....	.....
400	.....	.....	.....	2,430	.....

wells showing characteristics as depicted by curves in Figure 4 are now being considered as indicative of formation of either local or structural gas caps. This assumption is substantiated by behavior of a well recorded in Figure 6 and Table 6.

The data as presented in Table 6 are characteristic of the wells in the pool producing in or around the gas-cap area. The well is an offset to an input well located 1270 feet from it, and structurally down the dip in relation to the input well. Upon completion, the well produced at an approximate ratio of 1200 cubic feet of gas per barrel of oil, and subsequently the gas production increased to 3530 cubic feet per barrel in April and May of 1936, with the well producing through 2½-inch tubing.

A change to 2-inch tubing set within a few feet of bottom in September failed to improve the operating conditions, yielding a gas-oil ratio of 4230 cubic feet per barrel. A bottom-hole choke was only partly

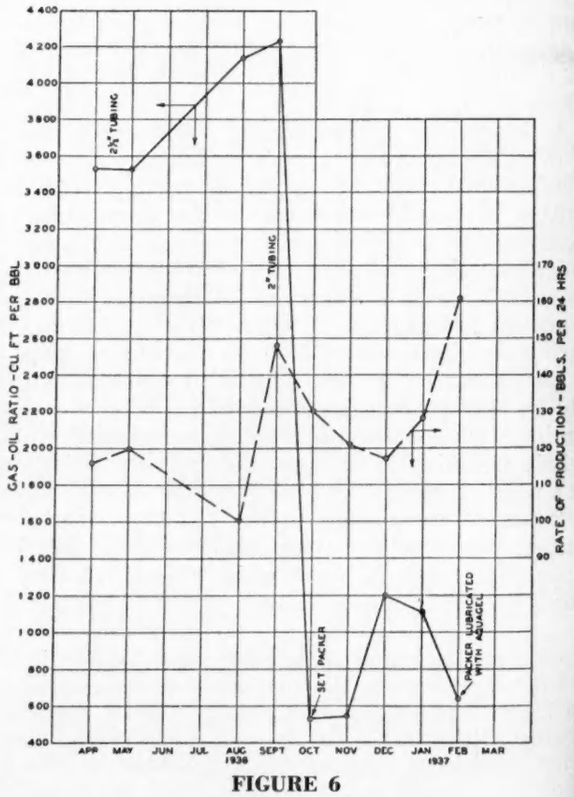

FIGURE 6

Effect of Packer on Gas-Oil Ratio

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BAKER CEMENT FLOAT COLLAR • BAKER CABLE TOOL CORE BARREL
BAKER CEMENT FLOAT SHOE • BAKER CEMENT GUIDE SHOE
BAKER CEMENT WHIRLER FLOAT SHOE • BAKER KELLY STRAIGHTENER

TABLE 6

Oil Production and Gas-Oil Ratio of Typical Well in the Gas-Cap Area, by Months, for 1936

MONTH	2½-Inch Tubing		2-Inch Tubing		Packer and 2-Inch Tubing	
	Rate of Oil Production per 24 Hours (Barrels)	Gas-Oil Ratio (Cubic Feet per Barrel)	Rate of Oil Production per 24 Hours (Barrels)	Gas-Oil Ratio (Cubic Feet per Barrel)	Rate of Oil Production per 24 Hours (Barrels)	Gas-Oil Ratio (Cubic Feet per Barrel)
April	111	3,530	.....	.....	.....	.....
May	120	3,520	.....	.....	.....	.....
August	.....	.....	100	4,140	.....	.....
September	.....	.....	148	4,230	.....	.....
October	.....	.....	.....	.....	130	530
November	.....	.....	.....	.....	121	550
December	.....	.....	.....	.....	117	1,200
January, 1937	.....	.....	.....	.....	128	1,110
February, 1937	.....	.....	.....	.....	161	640

successful, the gas rate remaining approximately the same but at a higher rate of production, i.e., for an equivalent gas-oil ratio a larger rate of crude oil was obtainable. An installation of the under-set packer in this well has reduced the gas to 550 cubic feet per barrel, indicating both the presence of the gas cap and the absence of vertical permeability in the vicinity of the well bore. A noted increase in the gas from 550 to 1200 cubic feet in December is attributable to gas leakage around the packer. This defect has been corrected by the lubrication of aquagel to the top of the packer.

Typical Packer-Equipped Wells

The group performance of wells equipped with the packers is illustrated in Table 7 and Figure 7.

A glance at each pair of the gas-oil-ratio curves in Figure 6, denoting relative values in gas-oil ratios, is in itself a convincing factor in recognition of the economic value of the use of under-set packers to control the producing gas-oil ratio. In the case of well "N" the gas volume was reduced approximately 2240 cubic feet per barrel for well "M," the decrease was 3350 cubic feet per barrel; and for well "L," 2810 cubic feet per barrel, or a combined reduction of 1,860,000 cubic feet in gas production per 24 hours at a rate of production of 200 barrels per day per well.

To date 11 wells on the "community" properties of the South Burbank pool are equipped with under-set packers, of which 9 are successful and 2 partly failures. One failure is possibly the result of operating conditions, while the other is attributable to defects in the neo-prene packing element. The type packer being run at the present time differs only from the first packer in the type of neo-prene used. This entire procedure of gas-oil-ratio control is still somewhat in the experimental stage, and much remains to be learned regarding the proper production control of wells equipped with packers.

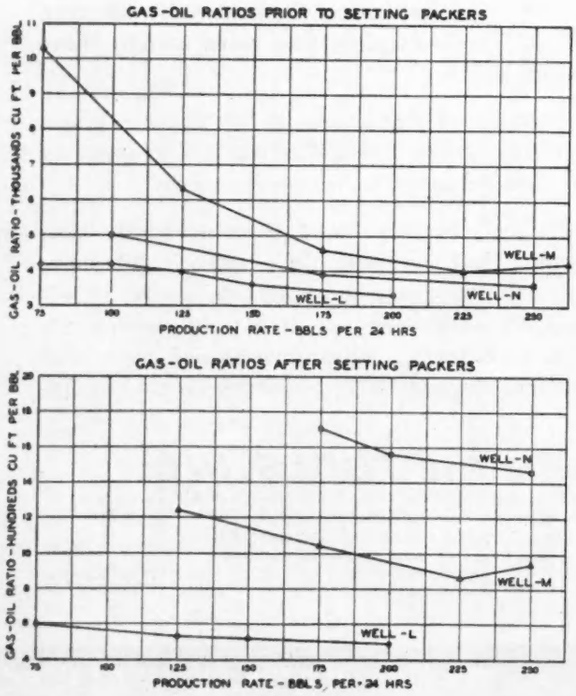

FIGURE 7

TABLE 7

Group Performance of Packer-Equipped Wells

Rate of Oil Production per 24 Hours (Barrels)	GAS-OIL RATIOS					
	Well "L"		Well "M"		Well "N"	
	Before	After	Before	After	Before	After
	(Cu. Ft. per Bbl.)					
75	4,150	600	10,300	.....	.....	.....
100	4,200	.....	.....	.....	5,000	.....
125	3,950	530	6,300	1,240	.....	.....
150	3,600	520	.....	.....	.....	.....
175	.....	.....	4,600	1,040	3,900	1,700
200	3,300	490	.....	.....	.....	1,560
225	.....	.....	4,000	860	.....	.....
250	.....	.....	.....	940	3,600	1,460
262.5	.....	.....	4,200	.....	.....	.....

Pressure-Maintenance Benefits

In summarizing the benefits of the production methods of the South Burbank pool under the pressure-maintenance program, operating partly under the unit agreement and jointly under the agreement of the pool operators, the following accomplishments are cited:

1. Crude-oil production with a minimum dissipation of gas from the reservoir, resulting in conservation of available gas energy.

2. Return of produced gas to the reservoir to maintain pressure and to facilitate drainage.

3. Elimination of gas wastage occasioned by frequent potential tests. The operators' agreement in the South Burbank pool provides for only one potential period and subsequent corrections of potentials by sub-surface pressures.

4. Sustained long flowing life of wells and consequent lower production costs per barrel.

5. Increased oil recoveries or yields per acre dependent upon pressure maintenance and preservation of the reservoir oil fluidity.

6. Low drilling and development investments effected by wider spacing.

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Proration of Allowable Oil Production

By LYNDON L. FOLEY,
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VARIOUS proration plans may be rated as to fairness as follows—the standard of equity being an allocation proportional to the recoverable oil under each lease:

***Per-well allowances*—equitable only if well-spacing and reservoir conditions are uniform.**

***Straight potential*—equitable only if well-spacing is uniform, and if well potentials are proportional to recoverable oil in place in the drainage area of each well.**

***Per-acre allowances*—equitable only if reservoir conditions are uniform.**

***Acreage allowance plus any other allowance*—will not give allocations proportional to the recoverable oil under a lease.**

***Acreage times potential*—equitable only if potentials are proportional to the recoverable oil under a lease. This plan gives each lease a per-acre recovery proportional to the well potentials.**

***Acreage times index of recoverable oil*—equitable if the index of recoverable oil is accurate. This plan gives each lease a per-acre recovery proportional to the index of recoverable oil, and is reasonable in the light of our knowledge of indices of recoverable oil at any given time it may be applied.**

The application of a reservoir-pressure factor to any of the above proration plans may correct wholly or partly any inherent inequity of the plan.

It must be emphasized most strongly that any factor which is considered indicative of the recoverable oil under a lease or proration unit must be multiplied by the acreage of the tract to determine the proration factor. It is only in this way that a daily allowable production may be assigned which will give each tract an ultimate per-acre recovery proportional to the "index of recoverable oil" of the tract.

This paper was presented at Seventh Mid-Year Meeting, American Petroleum Institute, at the Broadmoor Hotel, Colorado Springs, Colo., June 2, 1937. The statements and opinions expressed herein are those of the author, and should not be construed as an official action or opinion of the Institute or of this journal.

COMMERCIAL production of oil as a fuel began in the United States on completion of the Drake well near Titusville, Pa., in 1859. Crude oil from springs and seepages had been used for illumination and lubrication before this time, but had not been developed extensively.

Overproduction and Curtailment

The first overproduction occurred in 1861 on completion of several flowing wells yielding 2000 to 2500 barrels per day. The price of oil declined to 5 cents per barrel, which was a great hardship to the oil and cooperage industries. A great many similar periods of overproduction, with ruinously low prices, have afflicted the industry, and have led finally to the restriction of production to market demand. This has been done by voluntary agreement of operators, by proration of purchases on the part of pipe-line companies, and by orders of state regulatory bodies.

Oil was transported originally in barrels, each producer hauling his own oil to market in wagons. Railroad tank cars were introduced by the Baltimore and Ohio Railroad in 1866. Pipe-line development began in 1865. A 60-mile line to Pittsburgh was completed in 1874, and the first pipe line to the Atlantic seaboard was completed in 1879. The development of oil-transportation systems grew beyond the means of small operators, and the control of transportation became an advantage which was sometimes used unfairly to the detriment of small producers of oil. It was inevitable that court decisions would protect small operators, and pipe lines engaged in the transportation of purchased oil were held to be common carriers, thus establishing the principle of ratable takings. This led also to proration of purchases by the pipe-line companies in times of over-production.

State Regulatory Laws

The migratory nature of oil and gas in the ground was recognized by the courts,[1] and the so-called "law of capture" was applied to the ownership of oil and gas. The courts established in the case of The Ohio Oil Company v. Indiana[2] that the owners of oil lands could not operate wastefully to the detriment of their neighbors, and so established the police power of the states to prevent physical waste. The Corporation Commission of Oklahoma promulgated a proration order for the Cushing field in 1914, which was probably the first such order by a state regulatory body.

Curtailment by Proration

Granting the desirability of curtailing production to meet market demand, and granting that the states have the power to do so, there is still a wide range of opinion as to what constitutes equity in proration. Many people have held the opinion that proration should give each operator an allowable production proportional to his probable recovery under unrestricted production. This consideration led to the use of well potentials as the basis of proration. Restriction of production limits the individual's right to capture oil, and has led gradually to a recognition of the ownership of oil in place in the reservoir. The preponderance of opinion at present favors an allo-

cation of allowed production which will give each operator an allowable production proportional to the recoverable oil under his land. This principle was recognized by the courts in the case of Brown v. Humble Oil & Refining Company,[3] in which the court held that the recoverable oil under a given lease in a developed field could be determined approximately by experts who can also determine equitably the amount of oil and gas recoverable on each tract under certain operating conditions.

Reservoir Energy

Restriction of production is desirable in many fields in order to prevent physical waste. Many fields utilize their reservoir energy more efficiently under restricted production. Conservation requires that the most efficient rate of production for such fields be determined, and that production be restricted to that rate. This restriction for conservation purposes necessitates an equitable allocation of the allowable production among the operators in the pool.

Open-Flow Tests

Open-flow tests of wells, called potential tests, have been the most commonly-used basis of proration, and have been considered to be the best index of the productivity of a well. A great many factors affect the productivity of a well. Among them are porosity, permeability and thickness of the pay sand, the reservoir pressure, the gas-oil ratio, depth of well, size of casing, etc. By measuring the flow of the well, we can determine accurately the net result of all of these factors. There are disadvantages in taking potential tests: equipment is required which is not needed for regular production, and open flow may be detrimental to the reservoir. Proration is based in some fields on initial potential tests which are adjusted periodically according to reservoir-pressure decline or according to an agreed monthly percentage decline. Efforts are being made to find a satisfactory substitute for initial potential tests, but nothing completely satisfactory has been found to date.

Well Potential

Well potentials may be considered an index of the productivity, or of the recoverable oil, of a well. Proration on a basis of well potential only may be satisfactory under the theory of giving each operator an allowance proportional to his probable recovery under unrestricted production. If well potentials are an index of recoverable oil, and *if well spacing is uniform,* "straight-potential" allocation may give each operator an allowable production proportional to his recoverable oil. If well spacing is non-uniform, and we desire to give each operator a daily allowance proportional to the recoverable oil under his lease, it is necessary to use factors other than potential, especially the acreage factor.

Acreage Factor

Proration based solely on productive acreage has been used in some fields. This plan presumes that one acre is as good as another, and that reservoir conditions are uniform. This plan is equitable only if these conditions prevail. The wide range of productivity of wells, and the wide range of per-acre recoveries, indicate that these conditions do not prevail—even within a given oil field—and that so-called "straight-acreage" proration does not meet the requirement of allocating allowable production in amounts proportional to the recoverable oil under each lease. It does tend to discourage over-development, as wells on small tracts receive small allowances.

Per-Well Proration

Proration on a per-well basis has been attempted. This is equitable only when reservoir conditions and well spacing are uniform, a combination of conditions which probably will never be found. Furthermore, oil wells do not produce oil. Oil is produced by oil reservoirs, and a pipe in a well transports the oil from the reservoir to the surface of the earth in the same manner that a pipe in a trench transports the oil from the lease to the refinery. The so-called well potential is the rate at which the reservoir can deliver oil to the surface of the earth through a given well. Proration of allowable oil production should be based on reservoir conditions. The sole function of an oil well, in the operation of a proration plan, is to indicate that a lease or proration unit is productive, and to indicate the relative productivity.

"Acreage Plus Potential"

The first efforts to combine potential and acreage as proration factors evolved the so-called "acreage-plus-potential" plan. Under this system some portion of the daily allowable production is allocated to each operator in proportion to his share of the productive acreage in the pool. The balance of the allowable production is allocated to the operators in proportion to the potentials of their wells. A distribution of 50 percent of the allowable production according to acreage and 50 percent of the allowable production according to potential is used in a number of fields. One well will not drain an indefinite area and, obviously, the acreage factor per well must be limited. This is done commonly by dividing the field into proration units, presumably of uniform size so far as division of ownerships will permit, although the size of the proration units may vary in different fields. Each unit on which a producing well has been drilled is allocated a portion of the allowable production of the field. If more than one well has been drilled on a unit, it is common to use the average potential of the wells as the average potential of the unit. It would seem that the area of the proration unit should be the area of effective drainage of a well. Too large units may cause under-development, and too small units may cause unnecessary drilling.

The "acreage-plus-potential" system does not allocate allowable production proportionally to the recoverable oil under proration units or leases. This fact is illustrated by the following example. Let us assume two tracts, "A" and "B," containing 10 acres and 5 acres, respectively, and on each of which one well has been drilled. Let us assume that reservoir conditions are identical under the two tracts. Then "A" will have twice as much recoverable oil as "B"; and, since reservoir conditions are identical, the two wells may be considered to have equal potentials, say 1,000 barrels per day each. Let us assume that the allowable daily production of the two tracts is 120 barrels, to be allocated according to the formula 50 percent "acreage" plus 50 percent "potential."

The result is as follows:

	Acreage Allowance	Potential Allowance	Total Allowance	Percent of Total Allowance	Percent of Recoverable Oil
Tract "A"...	40	30	70	58.33	66.67
Tract "B"...	20	30	50	41.67	33.33
Total....	60	60	120	100.00	100.00

The discrimination in favor of the smaller tract is

obvious. Furthermore, we have shown that "straight-acreage" proration is based on the theory that one acre is as good as another. "Acreage plus potential" is based partly on that theory.

"Acreage Times Potential"

Still following the theory that well potentials are an index of recoverable oil, a plan has been proposed which may be called the "acreage-times-potential" plan. The product of well potential and productive acreage is used as a factor, and each lease or unit is allocated an allowable production proportional to this factor. On leases or units having more than one well, it is common practice to use the average potential of the wells on the unit as indicating the average productivity of the unit. This plan gives each lease or unit a per-acre recovery proportional to the average unit potential, and is equitable to the degree to which well potentials indicate recoverable oil. It may be illustrated by using the same tracts "A" and "B," which were used to illustrate "acreage plus potential."

	Acreage	Potential	Acreage Times Potential	Allowable Production	Percent of Allowable Production	Percent of Recoverable Oil
Tract "A"....	10	1,000	10,000	80	66.67	66.67
Tract "B"....	5	1,000	5,000	40	33.33	33.33
Total....	15	2,000	15,000	120	100.00	100.00

In this case each tract receives a share of the allowable production which is proportional to its share of the recoverable oil. The ideal case used as an illustration indicates that "acreage times potential" is more nearly equitable than "acreage plus potential."

The "acreage-times-potential" formula gives each tract a per-acre recovery proportional to well potentials or to average unit potentials. It is equitable to the degree to which potentials indicate recoverable oil. This plan is reasonable according to our present knowledge, and its use is much more common than is realized generally. If wells are spaced uniformly, with the same number of acres per well, the proration factors are proportional whether all potentials are multiplied by one or by the actual number of acres. Proration factors, proportional to "acreage-times-potential" factors, are obtained by using "straight potential" and neglecting the acreage *when wells are uniformly spaced.* Therefore, the use of "straight potential" gives the same result as "acreage times potential" if wells are uniformly spaced. Uniform 10-acre spacing is common in Oklahoma and Kansas, and the wells in these states are prorated on a basis of well potentials. This gives the same result as "acreage times potential" with 10-acre proration units.

Permeability Factor

Some engineers question whether well potential is a direct index of the amount of recoverable oil in place under a given unit. Two portions of a reservoir may have the same percent porosity and the same amount of oil in place, and yet have different well potentials if the permeability varies. A greater permeability will doubtless permit the recovery of a greater portion of the oil in place, but some engineers question that the increase in recovery is proportional to the increase in well potential with increased permeability. They question that a well potential of 10,000 barrels necessarily indicates 10 times as much recoverable oil as a well potential of 1,000 barrels. It has been suggested that we use the square root of the well potential ($\sqrt{P}$) as a proration factor. However, we do not know the exact relationship of permeability and recovery, so the selection of the square root or any other root of the well potential as a proration factor would be purely arbitrary.

Reservoir Pressure

In some fields in which well potentials are used as proration factors, reservoir pressures are used as a safeguard against inequities. Periodic pressure surveys are made; and rated well potentials, determined originally by flow tests, are adjusted in proportion to changes in reservoir pressure. In this manner wells showing greater than average pressure decline have their allowable production reduced, and those showing less than average pressure decline have their allowable production increased. This is good production practice, as it prevents the formation of low-pressure areas which tend to drain surrounding areas of higher pressure, and which tend also to permit uneven encroachment of water. Pressure adjustments may not be a complete safeguard against unequal drainage, particularly in reservoirs of high permeability. This is shown by the fact that a well which is shut in completely may have the same pressure decline as surrounding wells which have produced oil, if the reservoir is sufficiently permeable.

Acreage and Reservoir Pressure

Some fields have been prorated on a basis of acreage and reservoir pressure. For example, in the Monument field, New Mexico, 80 percent of the allowable production is allocated on an acreage basis, and 20 percent according to reservoir pressure. The allocation according to acreage presumes that one acre is as good as another, which is unlikely as discussed under "straight-acreage." The use of the reservoir-pressure factor may tend to equalize drainage. However, it is doubtful whether the pressure factor is given sufficient weight in the formula. Probably the formula would be better if acreage and pressure were multiplied, and the product used as a proration factor. As the formula is now applied, wells equally spaced would have equal allowances initially. Suppose that two wells, equally spaced, have initially equal reservoir pressures and equal allowances; then, if the reservoir pressure under one well declines 50 percent, its allowance would be 90 percent of the allowance of the well with the higher reservoir pressure. A 10-percent decrease in allowable production with a decrease of 50 percent in reservoir pressure is probably an inadequate adjustment. A well in a uniform spacing pattern, and having a reservoir pressure equal to one half of the average pressure, would have one half of the allowance of an average well if this type of proration were based on "acreage times pressure" instead of "acreage allowance plus pressure allowance."

Reservoir Energy

Recognition of the importance of reservoir energy, and its vital role in oil production, have led to the proposal of proration plans based on reservoir energy. Such plans are designed to permit each operator to use his proportionate share of the total energy of the reservoir. Some such plans propose that allowable production be stated in terms of total reservoir displacement, whether this displacement be caused by production of oil, free gas, water, or any or all of these fluids. The owner of a lease in the gas cap or the gas area of a field has cer-

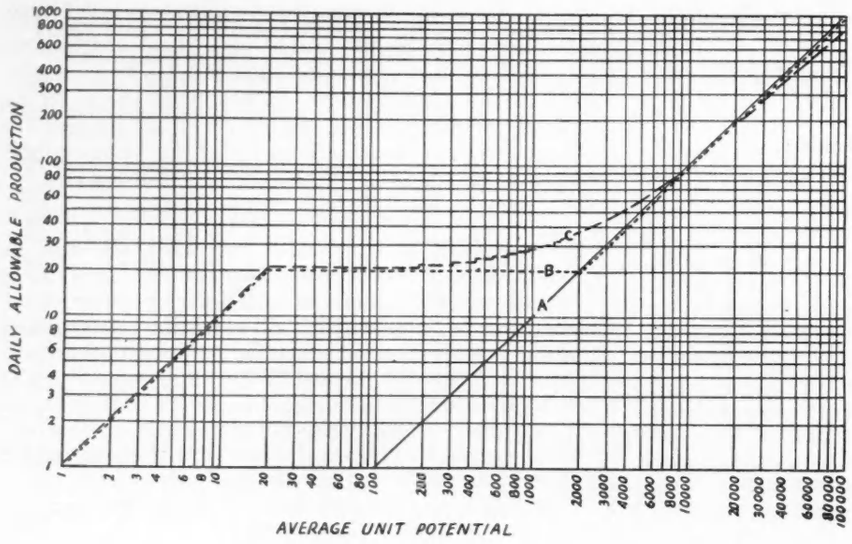


FIGURE 1
Effect of Minimum Allowances.

tain property rights, and the right to realize on his investment. At the same time, production of this gas diminishes the energy available for driving oil into the oil wells. All of the oil which is capable of moving out of a given volume of reservoir rock is recoverable oil. If it moves into an oil well, it is recovered. If it moves into a dry gas sand—replacing gas which has been removed—at least part of this recoverable oil adheres to the dry sand, and is never recovered. It is highly desirable, considering the pool as a whole, to retain the free gas in the reservoir until the recoverable oil has been produced, after which the gas may be produced and marketed. Attempts have been made to balance the rights of gas owners and oil owners by unitization of common reservoirs, by cooperation of operators, and by consideration of reservoir energy in proration plans.

Minimum Allowance

It is common practice to designate a minimum allowance below which no well may be restricted. This minimum may be established by law, or by commission order, or by custom. The minimum allowance commonly varies with the depth of the wells. The minimum allowance is applied in two ways:

1. A trial factor is determined by dividing the allowable production of the field by the total of the proration factors of all leases or units in the field. The factor which would give the minimum allowance is determined, and the minimum allowance is assigned to all leases or units having factors less than the minimum factor. The allowances of leases or units having minimum allowable production are then subtracted from the total allowable production of the field; the total of the proration factors of the minimum tracts is subtracted from the total of the proration factors of the field; and the remainders are divided. This gives the final factor to be applied to the proration factor of each tract receiving more than the minimum allowance.

2. The minimum allowance is given to each lease or proration unit in the field. The total of the minimum allowances is subtracted from the total field allowable production. The remainder is distributed to all of the tracts in proportion to their proration factors, and is added to the minimum allowance previously assigned.

The relative effects of the two methods of applying minimum allowances is indicated by the following example illustrated in Figure 1. Let us assume a field having 100 proration units, prorated according to average unit potential, the total of the average unit potentials being 1,000,000 barrels per day. Let us assume that the minimum allowance is 20 barrels per unit, and that the field allowable production is 10,000 barrels per day. Also that 10 units, having a total potential of 156 barrels per day, are unable to make the minimum allowance; and 25 units, having a total potential of 39,000 barrels per day, must be allowed not less than 20 barrels per day each. Allowances are given in the nearest integral number of barrels.

If the allowable production were prorated strictly in proportion, the daily allowable production would be 0.01 unit potential. This relationship is shown by the solid line **A** in Figure 1. A unit having a potential of 100 barrels would be allowed to produce 1 barrel per day; a unit of 2,000 barrels potential would be allowed to produce 20 barrels per day, etc.

First Method

The effect of the first method of applying minimum allowances in this example is as follows:

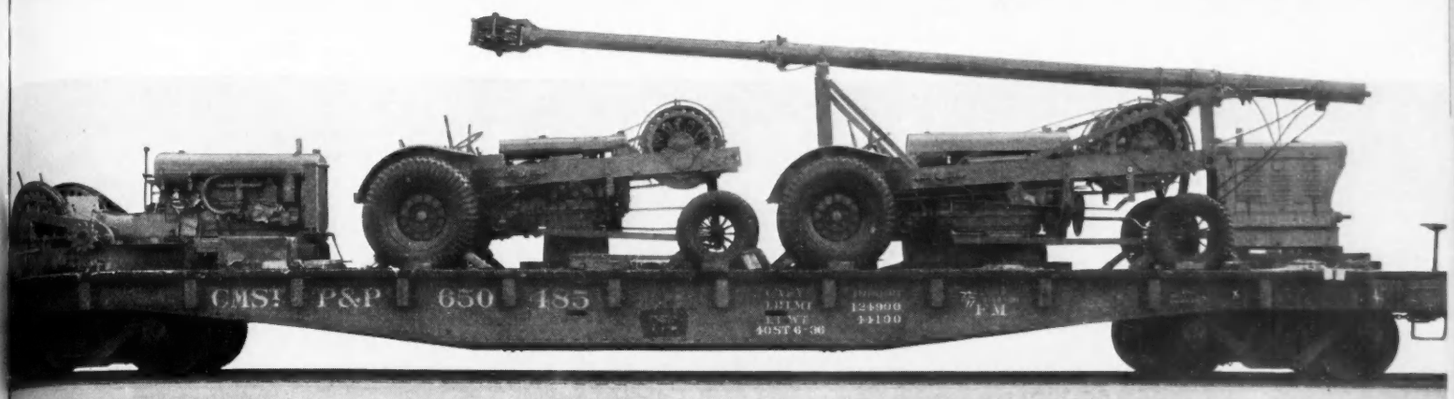
	Allowable Production	Average Unit Potential
Total of Field	10,000	1,000,000
Less units not making minimum	156	156
Less units assigned minimum	500	39,000
	9,344	960,844

The factor applied to the average potential of each unit to determine the allowable production of the unit is:

$$\frac{9{,}344}{960{,}844} = 0.009{,}724{,}784,$$

which is slightly less than the factor 0.01 for strict proportion. The allowable production under this method is shown by the dashed line **B.** It will be seen that all units having potentials less than 2,057 will receive extra allowances, and all units of higher potential are penalized. All units of higher potential are penalized a fixed percentage of their allowances under strict proportion. A unit having a potential of 10,000 is penalized 3 bar-

California Bound



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rels, or 3 percent. A unit having a potential of 20,000 is penalized 6 barrels, or 3 percent.

Second Method

The effect of the second method of applying minimum allowances is shown as follows:

	Allowable Production	Average Unit Potential
Total of Field	10,000	1,000,000
Less units not making minimum	156	156
Total minimum allowances	1,800	.....
	8,044	999,844

The factor applied to the average potential of each unit is:

$$\frac{8,044}{999,844} = 0.008,045,255.$$

The result obtained by applying the factor is added to the minimum allowance to determine the allowable production of the unit. This is shown by the dashed line **C** in Figure 1. Units having potentials up to 20 barrels per day are allowed to produce to capacity. Units having potentials from 21 to 186 are allowed to produce 21 barrels per day; units having potentials from 187 to 311 are allowed to produce 22 barrels per day, etc. It will be seen that all units having potentials less than 10,000 will receive more than they would receive under strict proportion, and all units of higher potential will be penalized. The penalties are not fixed in percentage: a unit of 20,000 barrels potential is penalized 10 percent, while a unit of 100,000 barrels potential is penalized 17.5 percent. This is a striking contrast to the fixed 3-percent penalty under the first method.

Both Methods Compared

In comparing the two methods of applying minimum allowances, it will be seen that the first method gives a result closer to that of strict proportion, and all units penalized are reduced in the same proportion. All units having potentials from 20 barrels to 2,100 barrels per day receive the same allowance under the first method; but this is not a valid objection, since all of them receive more than they are entitled to receive. The second method of applying minimum allowances is more inequitable than the first.

Daily Allowable

Oil in place in the reservoir is moved into the wells by reservoir energy. When the reservoir energy has been exhausted, oil ceases to move—unless new energy is added, as in repressuring and water flooding. The end of the life of an oil lease has been commonly determined by the exhaustion of the reservoir energy rather than by the exhaustion of the oil. If a lease is not developed until the reservoir energy of the pool has been dissipated by other producers, dead oil is left in the reservoir under the lease in question. Dissipation of reservoir energy by other leases may reduce the recoverable oil under a lease, even though there is no drainage of oil in place. The same principle applies to a lesser degree if a lease produces less than its fair share of the field outlet. Oil lands are valued commonly in terms of recovery per acre, and are purchased and sold on that basis. Anything which affects the recovery per acre of an oil property affects correspondingly the value of the property. A proration order which restrains an operator from recovering his share of the current production will prevent him from recovering his share of the recoverable oil of the field, and will result in confiscation of his property. The daily allowance of a lease or proration unit must be proportional to the recoverable oil under it if each lease is to recover its share of the recoverable oil by the time the reservoir energy is exhausted. The daily allowable production should be stated in terms of recovery per acre per day, since this figure determines the ultimate recovery per acre in a prorated field. The opinion of the court in the case of Boxrollium Oil Company v. Smith[4] contains a very significant statement: "Its allowable production is larger per acre than the allowable production of the wells of others on larger tracts in such fields." Note particularly the word of the court, *"Its allowable production is larger per acre."*

Equitable Proration

Equitable proration demands that each lease or proration unit must recover its own recoverable oil. It is necessary to determine an index of the recoverable oil of each tract in order to accomplish this. Well potentials are used most commonly for this purpose. The use of bottom-hole flowing pressures has been suggested, but they are not yet understood sufficiently to apply them in a proration plan. Sometimes well potentials are used with periodic adjustments to equalize reservoir pressures. Sometimes a uniform per-well or per-acre allowance is adopted initially, with periodic adjustments according to pressure decline. This plan presumes that inequities will show up as areas of abnormally high- or low-pressure decline, and that inequities of the original per-well or per-acre plan will be corrected as they develop.

Index of Recoverable Oil

The "index of recoverable oil" which is considered to be applicable should be multiplied by the acreage of the tract to determine the proration factor. The proration factor so adopted will give a recovery per acre which will be proportional to the adopted "index of recoverable oil." The following general proration formula is proposed:

Proration factor (Pf) = acreage of unit times index of recoverable oil

$$\text{Allowance of unit} = \frac{\text{Field allowance} \times Pf \text{ of unit}}{\text{Total of } Pf \text{ of all units}}$$

This general formula will give every proration unit a per-acre recovery proportional to its "index of recoverable oil." The equity of the formula depends on the accuracy of the "index of recoverable oil." The degree of fairness of its application will increase as our knowledge of indices of recoverable oil increases. A perfect "index of recoverable oil," used in this formula, will give each proration unit a daily per-acre recovery proportional to the recoverable oil under the unit. Continued application of the formula, with a perfect "index of recoverable oil," through the life of the field will give each tract the recoverable oil under that tract. Increased knowledge of the principles of well spacing may be applied to this formula by changing the unit size, or by additional drilling if the units appear too large. The proposed formula is perfectly flexible, and provides for improvement in proration technique as we increase our knowledge of the mechanics of oil reservoirs.

[1] Funk v. Haldeman 53 Pennsylvania 229.
Brown v. Vandergrift 80 Pennsylvania 147.
Westmoreland and Cambria Natural Gas Co. v. DeWitt 130 Pennsylvania 235.
[2] Townsend v. Indiana 147 Indiana 624.
The Ohio Oil Co. v. Indiana 177 U. S. 190.
[3] Brown v. Humble Oil and Refining Co. 83 SW (2d) 935. 87 SW (2d) 1069.
[4] Fed. Supp. 624.

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Vibration Problems In Oil Wells

By J. C. SLONNEGER,
The Continental Supply Company,
Dallas, Texas

THE author discusses a simplified method of calculating vibration frequencies as applied to sucker rods and cable tools, and shows ready reference charts for these frequencies.

In the discussion of the effects of vibration on oil well pumping, it is disclosed that the vibration of the rods has a profound effect upon the contour of the dynamometer card. This is shown by the development of a series of theoretical cards from the standpoint of vibration and well loads which have characteristic contours, easily recognized in the actual dynamometer card. Numerous dynamometer cards, taken from operating wells and covering a variety of well conditions, are shown which confirm the theoretical consideration.

Cable tooling is also briefly discussed.

There are, however, no hard and fast conclusions. The author leaves the subject open to further study and discussion.

This paper was presented at seventh mid-year meeting, American Petroleum Institute, at the Broadmoor Hotel, Colorado Springs, Colo., June 3, 1937. The statements and opinions expressed herein are those of the author, and should not be construed as an official action or opinion of the Institute or of this journal.

EVERY dynamic system has a definite fundamental natural frequency of vibration. This is true because all materials possess mass and elasticity and, therefore, are subject to vibration. Sometimes these vibrations are essential and desirable, sometimes of no consequence, and sometimes they are troublesome and not wanted. Usually it is desirable to know what the natural frequency of a system is, so that the design or operation, or both, may be governed to make use of or to avoid these vibrations as best suits the purpose.

It is apparent that in every-day engineering practice vibration problems are not given the consideration which is their just due. This is largely due to the fact that vibration problems have not been very well understood in the past. This need no longer be true; for the great work of Timoshenko, *Vibration Problems in Engineering,* is quite simple and clear. His exposition of the theoretical mathematics involved is unusually complete, and leaves little to be desired. Most vibration problems need only a wise application of the theory for their solution. It is the purpose of this paper to encourage a wider application of this engineering aspect to problems in the petroleum industry, and to present certain definite information for ready reference to that end.

Pendulum Formula

For the purpose of clarity in following the discussion, some of the fundamental principles of vibration will first be reviewed. In order to get at the simplicity of the problem, we must go to simple illustrations and analogies. First, the fact must be kept in mind that all vibrations, regardless of their nature, have their root in the fundamental principle that pure vibrations are simple harmonic motion. Hence, any simple harmonic motion may be used for a study of the fundamental principles. The simple pendulum serves this purpose admirably. The formula for the time of one complete vibration of a simple pendulum is given by:

$$t = 2\pi\sqrt{\frac{l}{g}} \qquad (1)$$

where:

t = the time, in seconds.
l = the length, in feet, from the support to the center of gravity.
g = the acceleration of gravity, in feet per second per second.

The frequency (f) per second is:

$$f = \frac{1}{t}$$

The frequency (F) per minute is:

$$F = \frac{60}{t} = \frac{60}{2\pi\sqrt{\frac{l}{g}}}$$

$$= \frac{53.8}{\sqrt{l}} \text{ for } g = 32.2 \text{ ft. per sec. per sec.} \qquad (2)$$

Thus we see, for a fixed value of g, the time and the frequency are a function of the square root of the length l. In the general equation for vibrations, we have:

$$t = 2\pi\sqrt{\frac{W}{Kg}} \qquad (3)$$

where:

W = the weight, in pounds.
K = the spring constant of the system defined as the force necessary to produce a deflection of unit distance or the couple necessary to produce a deflection of one radiant.

In the case of the simple pendulum for small displace-

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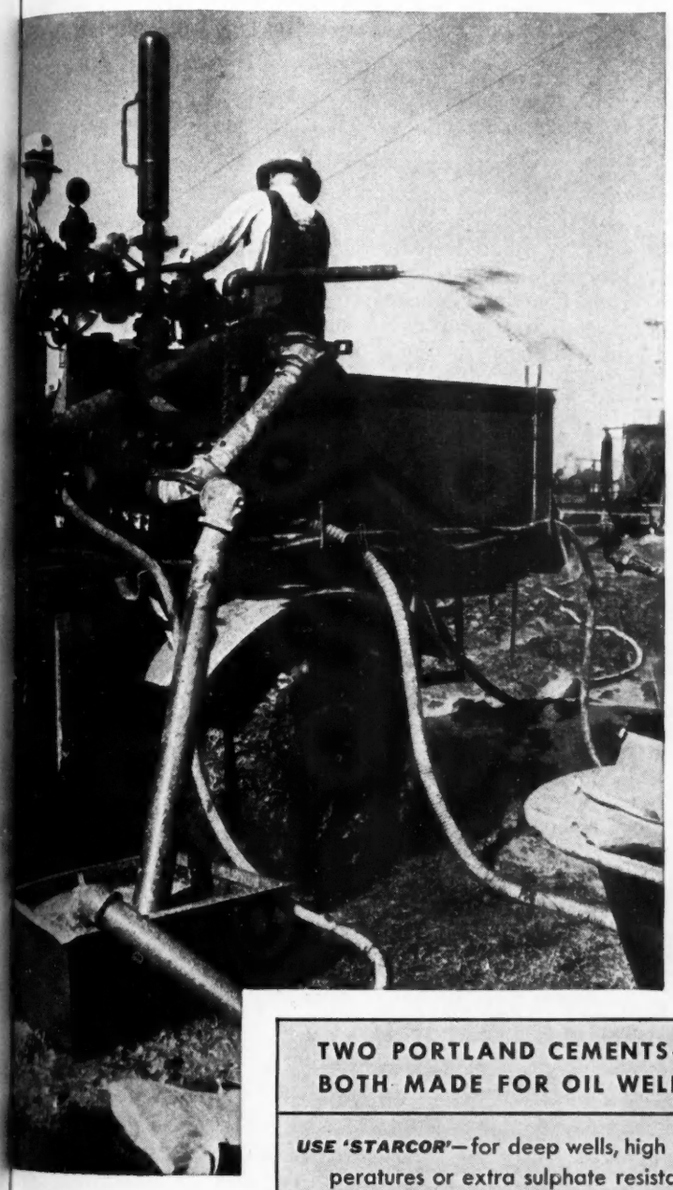

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ments, the sine of the angle is numerically equal to the angle expressed in radians, and then:

$$K = \frac{W}{l} \qquad (4)$$

When this is substituted in the general equation (3), W disappears, and we have equation (1).

In the case of a concentrated weight suspended from a spring, the value of $\frac{W}{K}$ equals the deflection of the spring (by definition of K) due to the weight W. If the deflection is represented by d, then:

$$t = 2\pi\sqrt{\frac{d}{g}} \qquad (5)$$

This shows that the period of this system is equal to that of a simple pendulum whose length l is equal to the deflection d of the spring due to the weight W. This regards the spring as being of very small mass as compared to the total mass.

Thus knowing the deflection of such a system, its period may be calculated by substituting a simple pendulum whose length l is equal to the deflection d of the system.

In the case of a string of sucker rods, the weight is not concentrated, but distributed along its entire length. The motion of each section of the rods is different from the motion of every other section and, hence, this formula does not apply. It has been suggested that this formula be applied to determining the frequency of sucker rods by substituting their elongation due to their own weight in the simple pendulum formula. It is here pointed out that this result will be about 10 percent in error for the reason just disclosed.

Velocity of Stress Transmission

There is another method which does apply, and has to do with the velocity of stress transmission in steel, which is another way of saying the velocity of sound.

If a sudden force be applied to the fixed end of a rod (fixed at one end only) that force is transmitted to the other end of the rod at the speed of sound in the form of a longitudinal wave. At the free end of the rod that wave is reflected and returns, but loses phase by one-half a wave. At the fixed end it is reflected without loss of phase, so that the rod contains only one-quarter of a wave length; hence, the length of the rod is one-quarter of a wave length. It is fundamental, of course, that the frequency is the velocity of stress transmission divided by the wave length:

$$F = \frac{V}{L} \qquad (6)$$

where:

V = velocity of stress transmission, in feet per second.
L = length of wave.
But L is $4D$, where D = length of rod.
Hence:

$$F = \frac{V}{4D}$$

Newton has shown that the velocity of stress transmission is:

$$V = \sqrt{\frac{E}{d}} \qquad (7)$$

where:

E = modulus of elasticity.
d = density, mass per unit volume.

In applying this to a rod string, fundamental units must be used.
Thus:

$$E = 29{,}000{,}000 \times 144 \text{ lb. per sq. ft.}$$

$$d = \frac{WrD}{g\left(\frac{a}{144}\right)D} = 16.9$$

Wr = weight per foot.
D = length of rods.
a = area, in square inches.

But:

$\frac{Wr}{a} = 3.8$ for all sizes of rods including couplings.

This reduces to:

$$V = \sqrt{\frac{29{,}000{,}000 \times 144}{16.9}} = 15{,}800 \text{ ft. per sec.}$$

Changed to feet per minute:

15,800 ft. per sec.....948,000 ft. per min.

$$F = \frac{948{,}000}{4D} = \frac{237{,}000}{D} \qquad (8)$$

Equation (8) gives the frequency of a straight string of rods. A tapered string of rods, theoretically, has a slightly higher frequency. In fact, a 50-50 tapered string of rods has the highest frequency for a given depth where two sizes of rods are used. The maximum value of this difference is about 4 percent; but, inasmuch as the frequency seldom is required to be known so exactly formula (8) is deemed sufficiently accurate for all practical purposes. The simplicity of formula (8) recommends its use; a more complicated formula would give no better results, and would only serve to frighten us away from its use. For these reasons it has been omitted.

Cable-Tool Problems

The use of equation (5) is most expedient in cable-tool problems. Here must be considered the stretch of the cable due to its own weight and that due to the weight of the tools. The exact data on the modulus of elasticity of a cable is difficult to obtain because of the twist of the cable. This no doubt varies with the age of the cable as well.

Considering a cable a continuous bar of steel, the relation between its area and its weight per foot is 3.4. Its modulus of elasticity is about 90 percent of that of steel. The equation for its elongation, due to its own weight, becomes:

$$C_e = \frac{D^2}{15{,}300{,}000} \qquad (9)$$

where:

D = length of cable.

The elongation due to the weight of the tool is:

$$C_t = \frac{WD}{EA} = \frac{WD}{26{,}000{,}000A} \qquad (10)$$

But:

$$A = \frac{W_c}{3.4D}$$

where W_c = weight of cable; and we may write:

$$C_t = \frac{W}{W_c}\ \frac{D^2}{7{,}650{,}000} \qquad (11)$$

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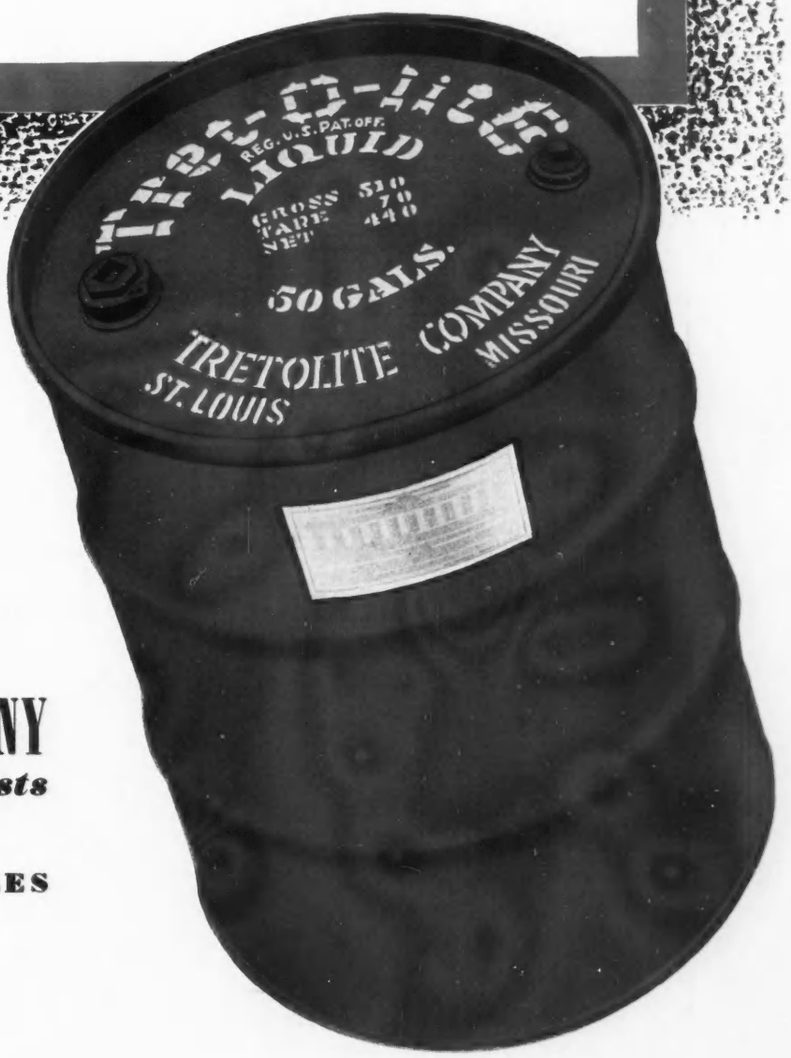

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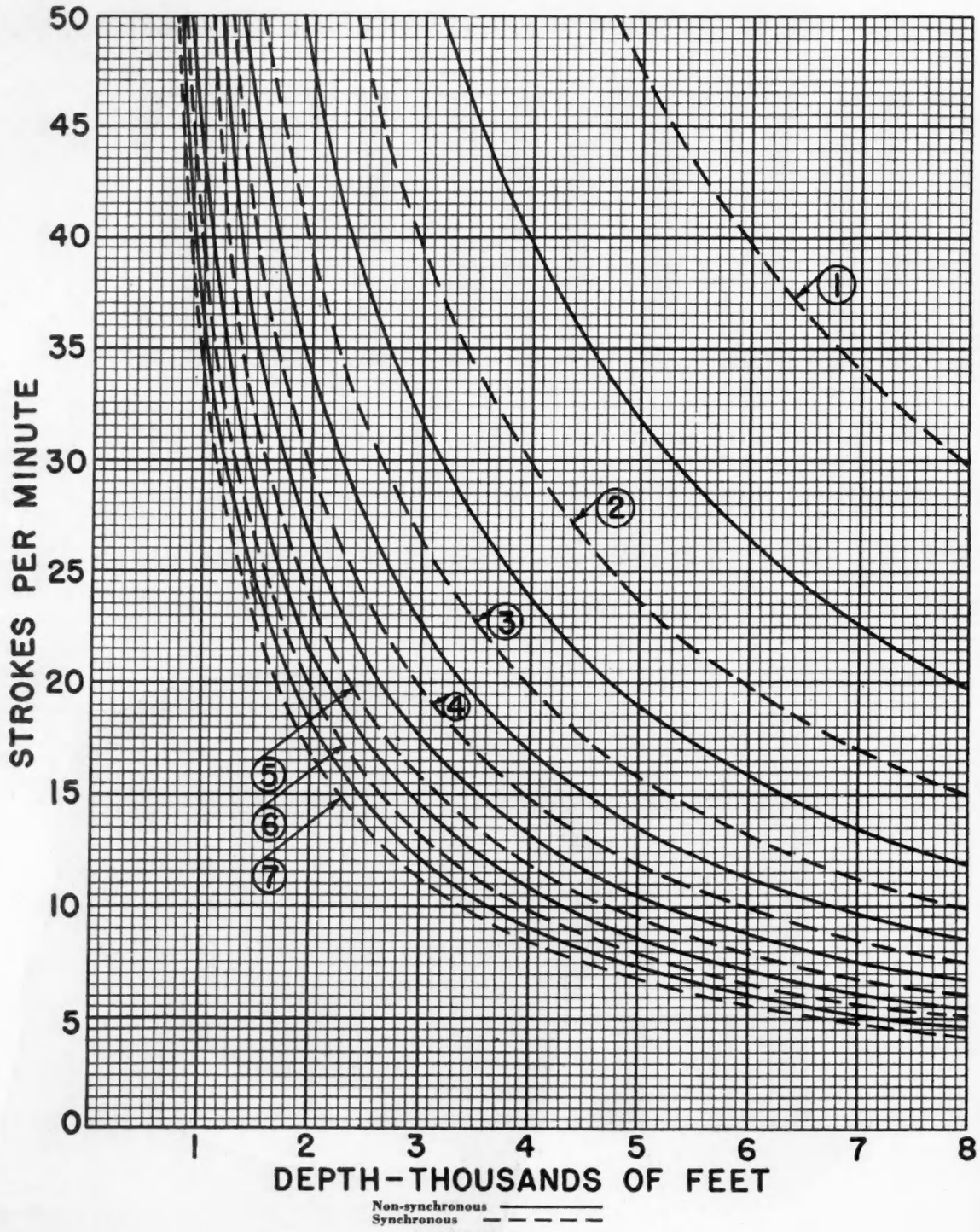

FIGURE 1
Pumping-Speed Curves.

Hence from equation (2) it becomes:

$$F = \frac{53.8}{\sqrt{\frac{D^2}{15{,}300{,}000} + \frac{W}{W_e}\,\frac{D^2}{7{,}650{,}000}}} \qquad (12)$$

Simplified further this becomes:

$$F_e = \frac{210{,}000}{\sqrt{D^2 + \frac{2WD^2}{W_e}}} = \frac{210{,}000}{D\sqrt{1 + \frac{2W}{W_e}}} \qquad (13)$$

Effect of Vibrations

Having these fundamental equations, the effect the vibrations produce is next considered. In any resilient system in vibration, the vibrations tend to die out due to energy absorbed by friction. Suppose a resilient system is set into vibration by a single impulse. The system will vibrate at its natural frequency, but each wave will be diminished due to friction, so that the waves become smaller and smaller, and, thus, finally disappear when all of the energy of the impulse has been dissipated by friction. Suppose now that, before that energy has been dissipated, another impulse be added. If this impulse be added at a certain instant, it will add to the energy, whereas, if added in opposition to the wave, it would subtract energy. When the impulses are timed so as to

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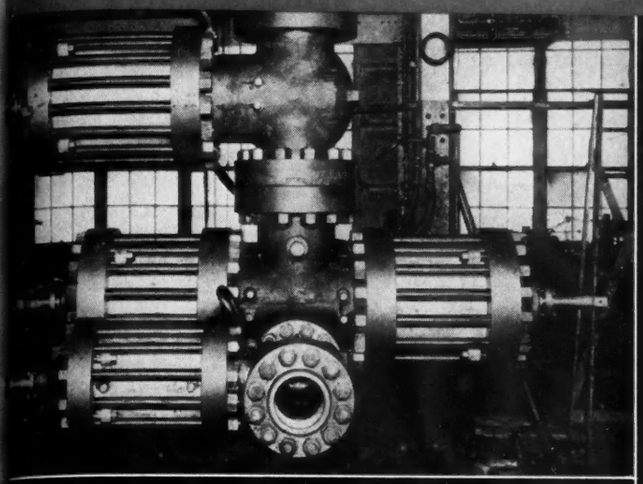
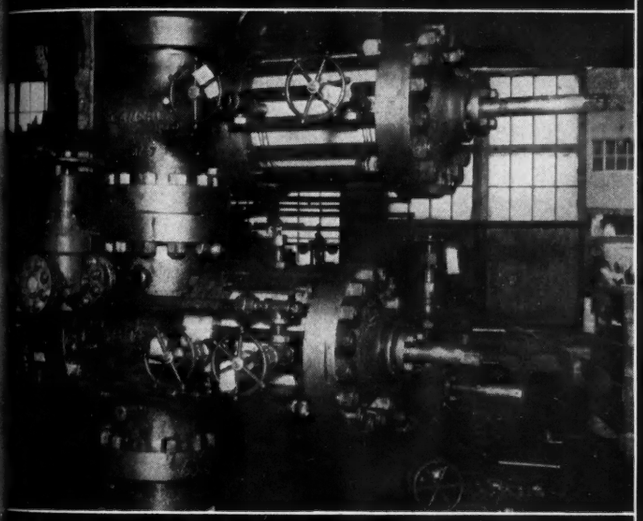
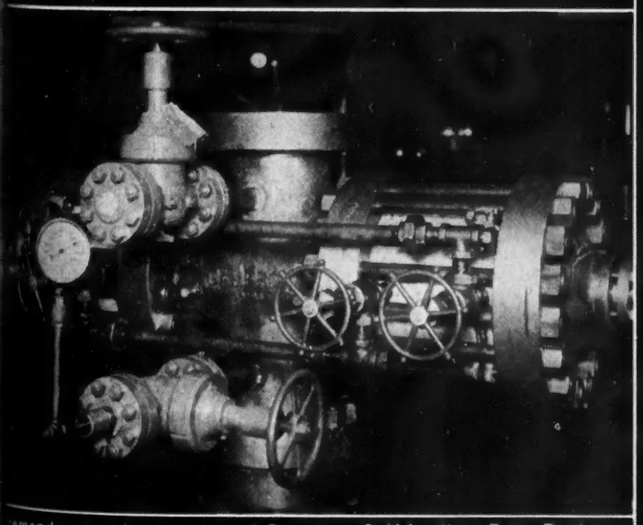


view of Cameron Pressure Operated 10¾"—6,000 pounds test g control hook-up, including Type SDA Preventer. Type DV Gate Valve and Type DV 7" Flowline Valve.



iew of drilling control hook-up shown above, illustrating in- ual 1½"—6,000 pounds test angle valves used in control mani- lock rams opened or closed hydraulically.



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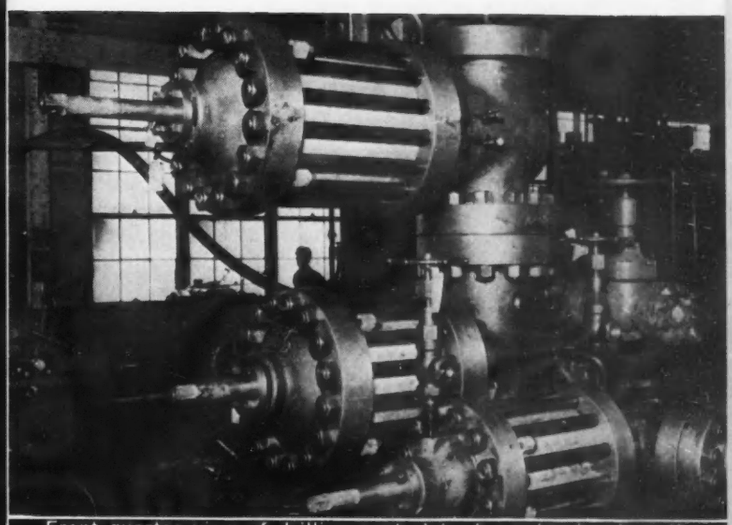


Front quarter view of drilling control hook-up showing how three of the four ram and ram-gate locking screws extend parallel and in the same direction, concentrating all closing wheels at two points outside the derrick floor.

add to the energy of the vibration, they are said to be in synchronism, or synchronous; and, when they absorb energy from the system, they are non-synchronous. The theory of resonance as developed by Timoshenko does not apply here, since his theory is based upon a periodic force which itself is a simple harmonic. That theory applies to such phenomena as sound, electron vibration, and dynamic balancing. His equations for the magnifying factor and phase angle are quite exact when the periodic force is as in simple harmonic motion, but it is wholly misapplied when the force producing the vibrations follow some other law. This force is commonly called the disturbing force, and more often is not a force due to harmonic motion. In the instance cited above it is a pure sine function; whereas in most mechanical problems it is an impure sine function, or a series of timed impulses. An excellent example of this is to be found in cable tooling, wherein the driller uses a very unsymmetrical motion (a very impure sine function, if you please) to produce a large vibration of the tools.

Again, if the timed impulses occur at intervals exactly equal to the natural frequency of the system, these are then known as "first-order" vibration. When the frequency of the impulses has exactly one-half the frequency of the system, the impulses are known as "second-order" vibration; one-third, "third-order," etc.

Obviously, other things being equal, the first-order vibration will be most severe, since energy is added to each wave. It is worthy of note that, as the frequency of the disturbing force becomes greater than the natural frequency of the system, its capacity to magnify vibrations very quickly disappears entirely. If, however, the frequency of the disturbing force is non-synchronous, then the impulses sometimes interfere with the vibrations, or rather start a second train of waves out of phase which partially interfere with the previously-excited waves.

Dynamometer Cards

Figure 1 illustrates a series of curves, using depth for abscissa and frequency per minute for ordinates, showing the frequencies which are in synchronism with the natural frequency of the system based upon formula (8).

The dotted lines are first-, second-, third-, etc., order frequencies as indicated. Approximately half-way between these curves are solid-line curves which are non-synchronous, or 1½-, 2½-, 3½-, etc., order vibrations.

The dynamometer card from a pumping well records the forces occurring in the system. These forces are the sum total of all forces including those due to the vibration of the rods. It is sometimes a difficult matter to separate or isolate the forces due to vibration. Perhaps it will be less confusing to an understanding of this matter to start from the opposite end, i.e., to start with simple vibrations, and develop them into a dynamometer card. Figure 2 **A** shows a simple train of two complete waves, as shown by the solid line, plotted against equal intervals of time. If these two waves were exactly contained in one cycle, that cycle could be represented by folding one wave back upon the other, as indicated by the dotted line, thus making a continuous curve which would repeat itself cycle after cycle. This is accomplished in the dynamometer by reversing the motion of the card; however, the motion of the card represents equal displacements, and not time. The displacement at the beginning and end of the stroke is much smaller for equal intervals of time than at mid-stroke. Figure 2 **B** shows that distortion of the wave due to the non-uniform motion of the card. If a dynamometer card were taken from a string of rods suspended in a dry hole, and if the number of strokes per minute were exactly one-half the natural frequency of the rods, it would have the appearance of Figure 2 **B.**

The net area of the card is zero, since no work is done. The horizontal line would represent the weight of the rods, but in a pumping well the force necessary to lift the fluid is also recorded in addition to the force due to vibration. In Figure 2 **C** the dotted-line parallelogram represents the forces necessary to lift the fluid only. When these forces are added to the forces of vibration, a card is produced of the form shown by the solid-line curve in the same figure. In an actual dynamometer card, forces of friction and other disturbances due to many factors are superimposed upon this curve. They distort it, but do not alter its general form. We are not here concerned with the magnitude of the forces, but rather with the contour of the card. Cards of this contour can be identified quite readily as second-order vibrations.

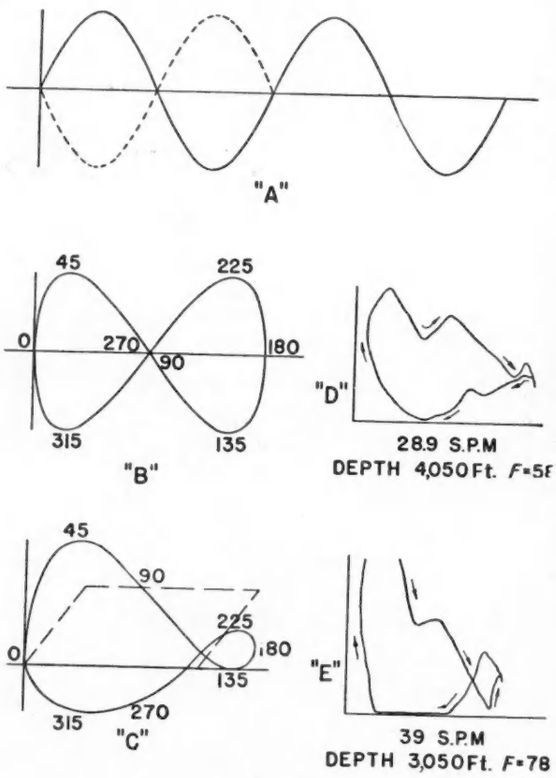


FIGURE 2
Second Order —Two Waves.

Dynamometer cards of this class are shown at **D** and **E** in Figure 2. The vibrations superimposed upon these cards are perhaps due to the vibration of the tubing or to a delayed action of the traveling valve, or the reaction of fluid waves in the tubing. This impulse peaks about in the middle of the upstroke, and the waves from this impulse are damped out rather quickly. The characteristic small loop at the end of the upstroke has degenerated into a little tail due to interference or, rather, the superimposition of the impulse wave. It can

be readily seen that a loop would be formed if this impulse wave was eliminated. In the case of the end **E** an impulse appears also, but it is not of sufficient magnitude to prevent the formation of the loop. The rods left the hanger on the downstroke; and, of course, the dynamometer had to stop at zero. On the upstroke the load for a time went beyond the scale of the instrument.

In Fig. 3 a card is developed for the third-order vibrations by the same procedure as in Figure 1. The steps **A, B,** and **C** in Figure 2 correspond to the same steps in Figure 1.

The small loop at both ends of the card is quite characteristic. The area of the card is concentrated in the center of the card, whereas in the second card the area of the card was concentrated at the beginning of the stroke. Also the loop at the beginning of the upstroke is usually higher than the loop at the end of the upstroke.

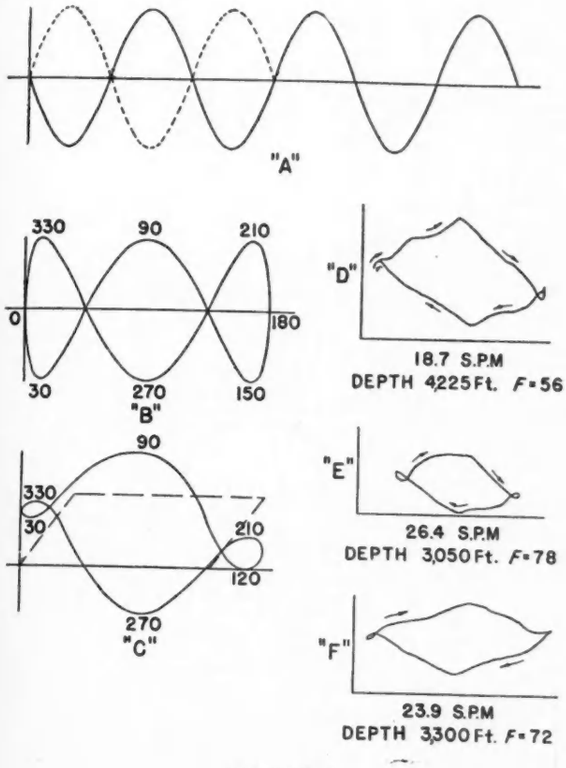


FIGURE 3
Third Order —Three Waves.

The card **D** in Figure 3 is quite characteristic. The loop at the beginning of the upstroke is distorted by small disturbance, which may be engine impulse. There appear to be about 11 of these waves in the card, which correspond to the number of explosions of the engine per revolution of the well crank. **Card E** is almost an exact duplicate of the theoretical **Card F** shows sufficient damping to prevent entirely the formation of the loop at the end of the upstroke, and maintain a higher load at that point rather than at the beginning of the upstroke. This card shows that the general form of a theoretical card is maintained.

Figure 4 (**A, B,** and **C**) shows the development of a fourth-order card as before. **C** in the same figure shows the effect of a slightly different phase angle. The characteristics of this card are that the load at the end of the upstroke is as great as at the beginning of the stroke.

It is unfortunate that an exact fourth-order card was not available; however, card **D** is just a little faster than the fourth-order, and card **E** is a little slower. This shifts the phase angle, but does not

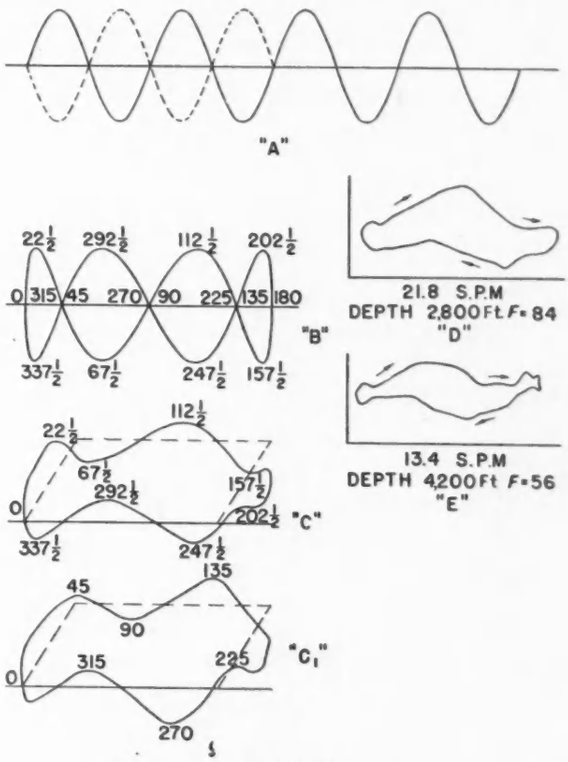


FIGURE 4
Fourth Order—Four Waves.

wholly destroy the card. In the actual card the fact must be kept in mind that the time element on the upstroke is not of necessity the same as on the downstroke. This depends upon the degree of counterbalance. In cards of the higher orders this uneven motion tends to distort the shape of the card because of the great number of waves in the card.

Figure 5 (**A, B,** and **C**) shows the development of a fifth-order card. The finish of the upstroke is usually higher than the beginning. The examples given at **D** and **E** are not exact fifth-order cards and are, therefore, somewhat out of phase with the theoretical card; yet their form can be recognized.

While it is possible to develop the cards for the sixth-, seventh-, eighth-order, etc., it is deemed sufficient here simply to show only examples of these cards as taken by the dynamometer. Figure 6 is such an exhibit, and needs no further comment.

At speeds other than that of an exact order, the card is modified by a change in phase angle. Let us suppose that we start with an exact-order card such as the second-order, and gradually diminish the speed until the third-order is reached. We should find that the second-order card form persisted in a modified form until the speed was the natural frequency divided by 2.4. For the want of a better terminology, let us call this the "2.4 order." At about the "2.5 order" the third-order form would begin to make its appearance. This form becomes more distinct as we approach its exact order card. Figure 7 shows a series of cards from the second to the third order. These

cards are all from the same well. It is not difficult to follow this transition.

Figure 8 shows the transition from a third order to the fourth order. The exact fourth-order card is missing in this series. This exact fourth-order card would no doubt have the appearance of theoretical card as shown in Figure 3**C**. The last card shown is a "3.4-order" card from another well.

The higher cards begin to assume the form of the

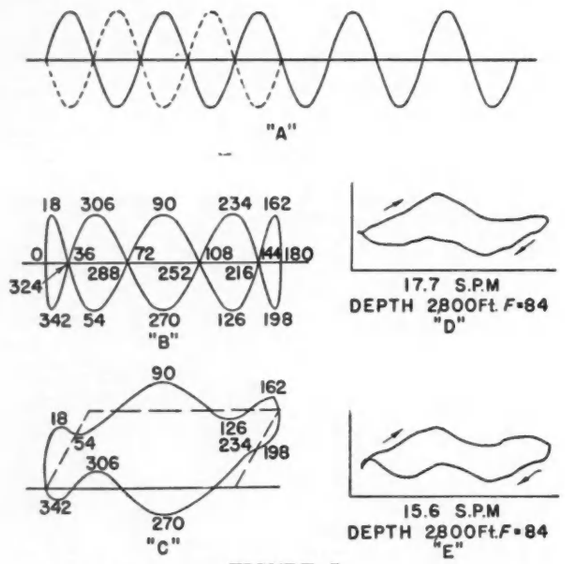
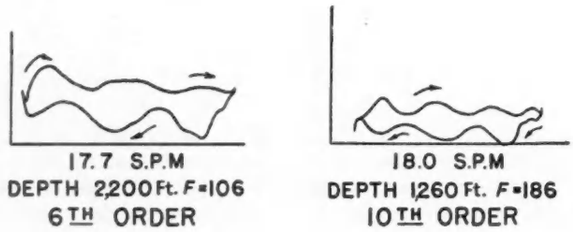


FIGURE 5
Fifth Order—Five Waves.



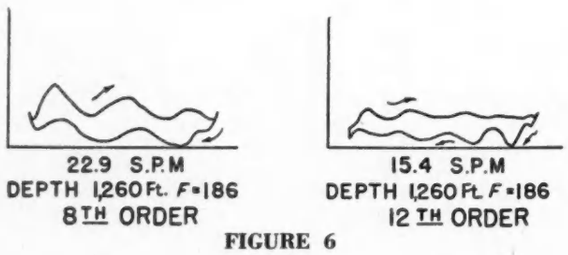


FIGURE 6

parallelogram of the load with superimposed vibrations; and the transition from one order to the next is rather difficult to secure, since only a few strokes per minute are required for the transition.

It is hoped that this general outline of card form will serve as a basis for further study and analysis. It is realized that it is far from complete. In making a study of cards in this respect, hasty conclusions must be avoided. For instance, it must be borne in mind that, as the strokes per minute are reduced, the velocity of the rods are reduced also; hence, the disturbing force is also reduced. To get a fair comparison, we should really have a constant rod speed. We should compare, let us say, 20 s.p.m. at 72 inches with 30 s.p.m. at 48 inches, if we are to compare production and rod loads.

In the second-order cards it is quite apparent that the greatest load on the rods is near the beginning of the stroke, and probably justifies the calculation of this load by acceleration, which involves the square of the angular velocity; but it is also apparent that the load, due to fluid, does not enter into it. In all other orders the acceleration, due to the crank motion, does not enter into the consideration at all. The magnitude of the vibration depends upon the

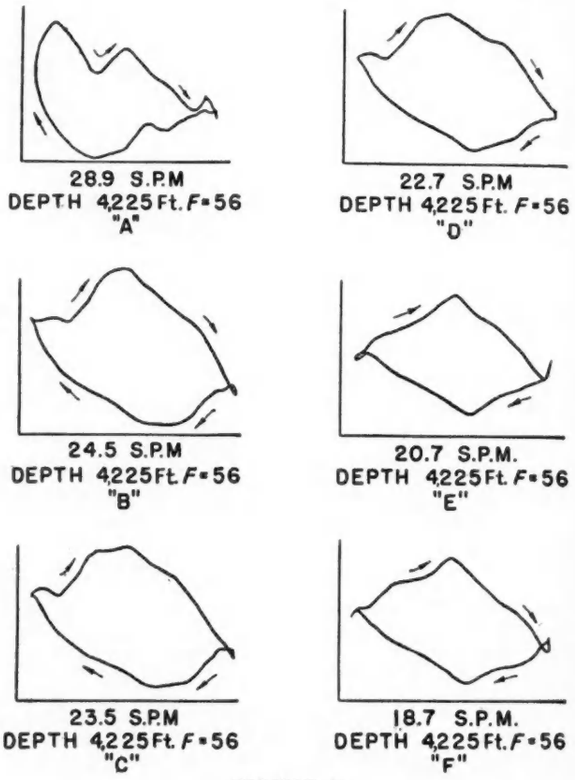


FIGURE 7

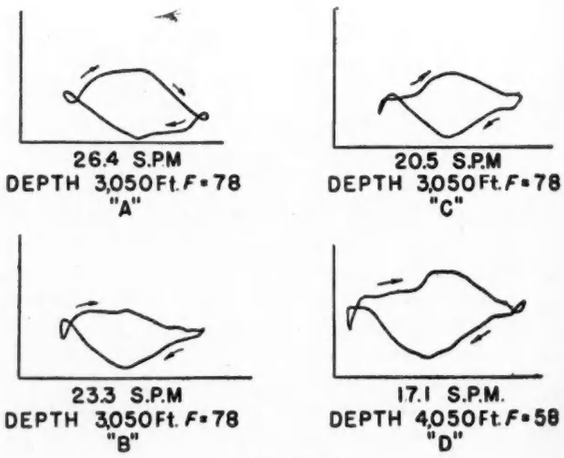


FIGURE 8

velocity of the rods and the degree of synchronism, and does not in any way involve the square of the angular velocity. This point is brought up because it has long been argued that the well load is a function of the square of the angular velocity, even

though the dynamometer card has long denied it. Furthermore, those who study this method of attack on pumping problems will find that the proper proportioning of the rod string to the fluid load can diminish the amount of rod vibration. It is hoped that others will be able to contribute to this work, and thus learn to avoid the unnecessary forces and diminish the unavoidable vibrations in the rods.

In cable tooling it is an interesting observation that the driller makes use of an exact second-order vibration (see Figure 9). He has learned from experience that this gives the maximum blow. As already pointed out, this vibration is maintained by an unsteady motion. The unsteady motion makes for a little broader tuning; hence, the speed need not be so exact. It is quite possible to calculate the depth of the hole from the number of strokes per minute, knowing the size of cable and the weight of the tools. The writer has often done this; and, hence, it is certain that a skilled driller uses the second-order vibration. Here, as is usually the case, art was ahead of science.

Acknowledgment

The writer wishes to acknowledge his indebtedness to D. O. Barrett of the Gulf Oil Corporation, and to many engineers and operators of other organizations, for their kind cooperation and for much of the data upon which this paper is based.

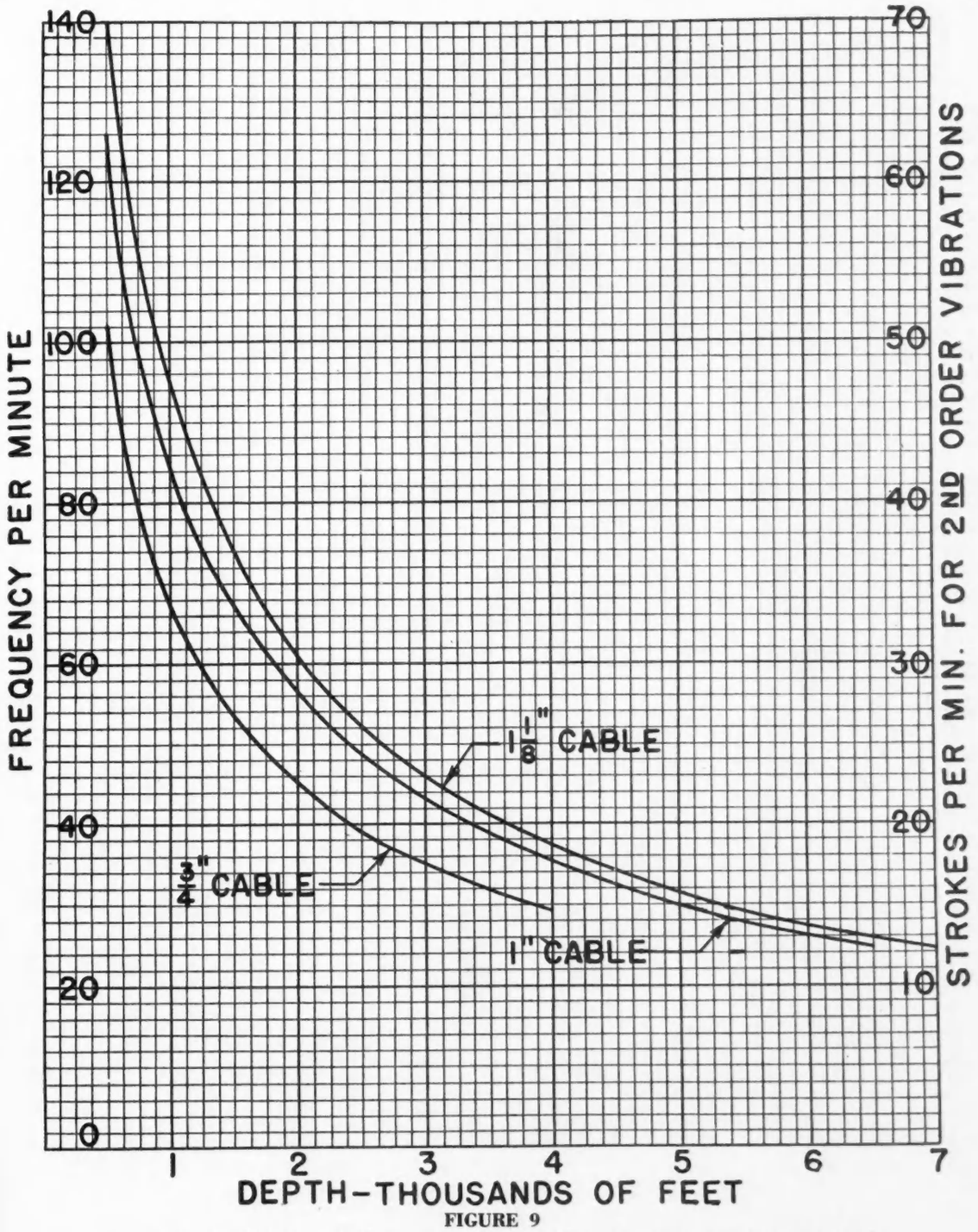


FIGURE 9

Curve Showing Relation of Frequency to Depth—¾-Inch, 1-Inch, and 1⅛-Inch Cable with 4,000-Pound Tool.

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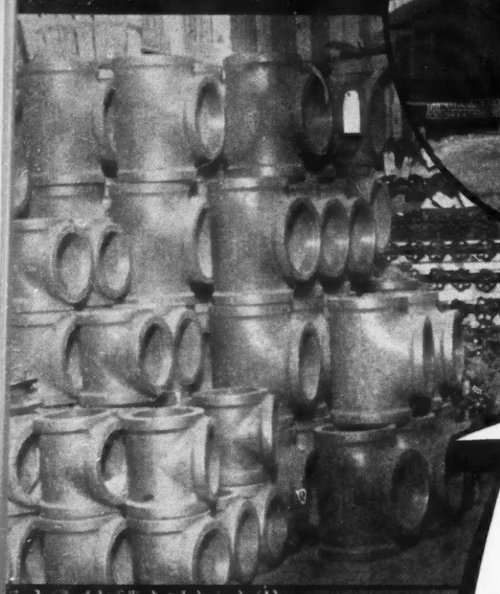
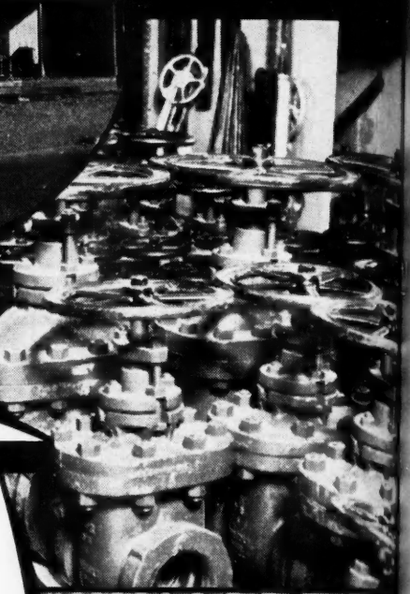
Oil Field Supplie





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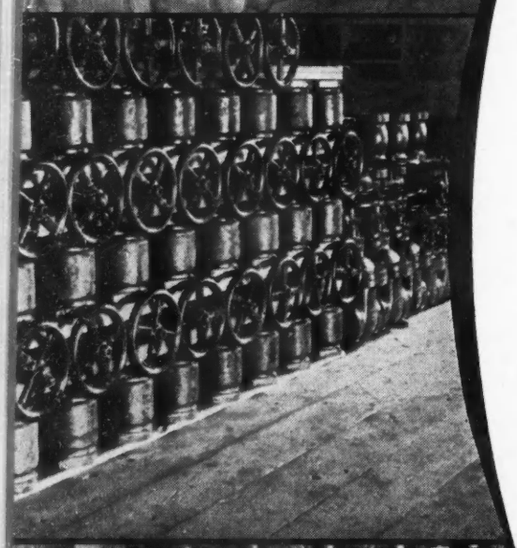
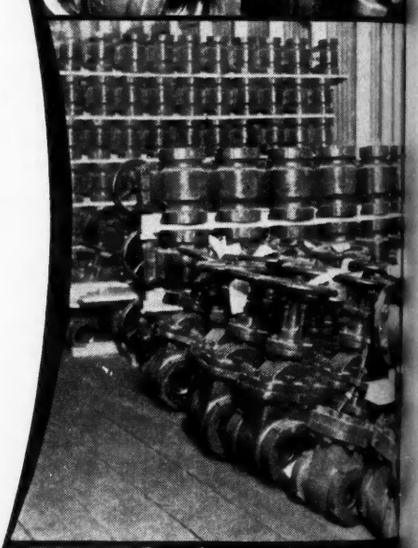
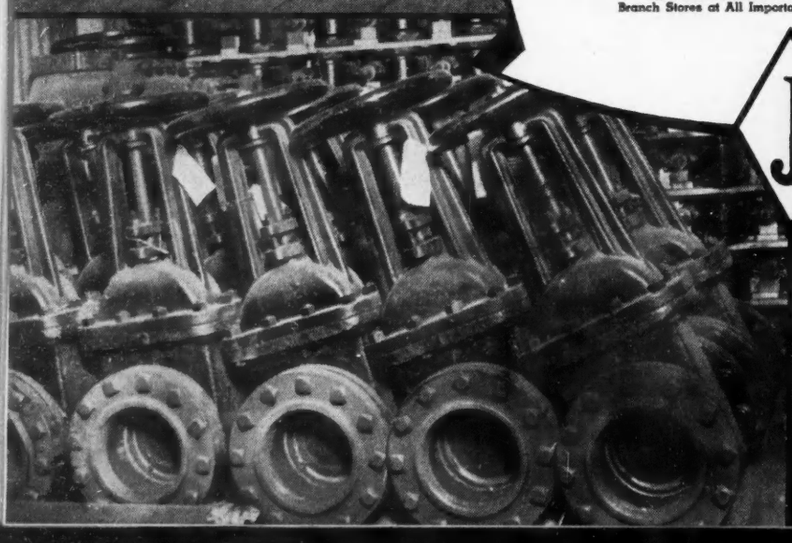






MEN IN THE INDUSTRY'S NEWS

WALLACE E. PRATT NAMED MEMBER OF EXECUTIVE COMMITTEE OF STANDARD OIL COMPANY (NEW JERSEY)

»

TEAGLE AND FARISH EXCHANGE PLACES IN EXECUTIVE LINE UP

»

WALLACE E. PRATT, vice president and member of the board of directors of Humble Oil & Refining Company, has resigned to become vice president, director, and member of the executive committee of Standard Oil Company of New Jersey. He had been with the company for 19 years, and prior to 1918 had a very interesting service record with other organizations.

Pratt, who succeeded the late Chester O. Swain, was born at Phillipsburg, Kansas, March 15, 1885, and spent all of his boyhood in that state. He graduated from the Phillipsburg high school in 1901, and continued his studies at the University of Kansas. He holds B.A., B.S. and M.A. degrees, as well as a degree in mining and geology from that institution.

He married Pearl M. Stuckey of Formoso, Kansas, in December, 1912. They have three children, Fletcher Stuckey, Nancy Jane and Houston Wallace Pratt. They have lived in Houston since 1916.

Pratt was assistant with the Kansas Geological Survey during 1908 and 1909; did work with the Geologist Bureau of Science, Manila, Philippine Islands, from 1909 to 1912, and was head of the division of mines, Bureau of Science, from 1913 to 1915. He became a member of the geological staff of The Texas Company in 1916, and in 1918 went with Humble Oil & Refining Company. His rise with the company was rapid, and he has been a member of the board of directors for several years. At one time he was chief geologist for the company.

He is the author of about 50 papers on all phases of geology, and is a member of several geological societies. He is a Fellow of the Geological Society of America; member of the American Association of Petroleum Geologists; A.A. A.S., Society of Economic Geologists; A.I.M.M.E.; Seismographical Society of America, and Sigma Xi. He is a former president of the American Association of Petroleum Geologists.

WALLACE E. PRATT

WALTER C. TEAGLE has assumed the chairmanship of the board of Standard Oil Company of New Jersey, the change from the presidency of the organization having been prompted by a desire to give more time to special work. Teagle has been president of the company for 20 years, and in announcing the change stated that he had remained in that position much longer than contemplated when first elected.

He will be succeeded as president by W. S. Farish, who for some time has been chairman of the board. Farish, who is 56 years old and a native of Mississippi, was one of the organizers of Humble Oil & Refining Company, now a subsidiary of Standard Oil Company of New Jersey. He has been active in the oil business since his graduation from the University of Mississippi in 1900. He moved to New York four years ago, and since that time has been familiarizing himself with the ramifications of the giant oil company.

Teagle told stockholders that company interests produced 9,658,000 barrels during the first year of his presidency, and that during the past year production was 206,356,000 barrels.

R. P. HUGGINS of Los Angeles, formerly auditor for Western Gulf Oil Company, has been made manager of California operations for the organization, succeeding A. E. Wallace, who resigned to devote his time to private afffairs. Jerry Bowen of Bakersfield has been appointed manager of field operations for the company in California.

FRANK HO LEM, director of Golden Gate Oils, Limited, has returned to Calgary, Alberta, from a business trip to Vancouver and Victoria, where he conferred with associates relative to drilling plans of the company in Alberta.

CAMPBELL M. HUNTER, geologist of London, England, was a business visitor in Calgary, Alberta, Canada, last week. He organized the Hunter Valley Oil Company, active in Alberta.

ING. JOSE D. BAEZ, chief of the Mexican government's petroleum department, has been sent to New York by the administration in connection with oil negotiations it is conducting. It is understood that Baez's mission has to do with the national petroleum company the government is organizing. He is to spend about three weeks in New York.

C. S. WARREN, superintendent of the Kansas production division of Empire Oil & Refining Company, has been promoted to general superintendent of production and will maintain headquarters in Bartlesville, Oklahoma. He succeeds J. E. Howell, whose resignation to become vice president in charge of production for Lion Oil & Refining Company becomes effective June 15. Warren, a graduate of both Alabama University and Alabama Tech, joined Empire as a junior engineer in 1919. He has been superintendent of the Kansas production division since 1930.

ARTHUR SIMMONS was in charge of the seventh annual geological field conference held at Bradford, Pennsylvania, last week. The program for the three-day meeting included trips to the Kendall Refining Company plant, the Belmont Quadrangle Company property, and the Venango County oil fields.

M. E. CHAPMAN, formerly division engineer for Gulf Oil Corporation at Chase, Kansas, resigned to become Mid-Continent representative for Chemical Process Company with offices in the Thompson building, Tulsa.

ELLIS STALLARD, formerly a member of the scouting department of Carter Oil Company at Tulsa, has been transferred to the district office of the company at Great Bend, Kansas.

HOWARD STUTCHBURY, assistant secretary of Abasand Oils, Limited, Canada, has been named assistant to the president of the company. Stutchbury, who is a former trade commissioner for the province of Alberta, will be located at the company's head offices at Edmonton.

IRA DUGAN, conservation officer in the Ada district of Pontotoc County, resigned as of June 1. Dugan, in the field since its opening, was succeeded by Hugh Thomas, his assistant. Reassigned to duty in the field were Bryan M. Mitchell and Claude LaHue, deputies.

R. J. MACON has been made manager of credits for the Mid-Continent division of Frick-Reid Supply Corporation, coming to the Tulsa office from Houston, Texas. He is succeeded at Houston by V. V. McGrew, formerly in charge of the Kansas territory of the company.

C. A. McCOLLUM of The National Supply Company at Tulsa, has been transferred to Houston as division manager. He was manager of sales at Tulsa.

Scores Depreciation

WOULD REDUCE ANNUAL PERCENTAGE OF DEDUCTIONS

Washington, D. C.—Immediate enactment of legislation to narrow the use of the percentage depletion provisions of the revenue laws for the reduction of income taxes, estimated as costing the treasury some $75,000,000 a year, was asked of congress June 1 by President Roosevelt.

Assailing "clever little schemes" adopted by wealthy taxpayers who want "civilization at a discount," the president in a special message asked legislation to plug up loopholes in the present income tax laws and the authorization of a thorough investigation of the situation by the treasury department which would lead to further recommendations.

Morgenthau Outlines Avoidance

Incorporated in the message was a report from Secretary of the Treasury Henry Morgenthau, Jr., outlining eight major methods of tax avoidance disclosed by a preliminary examination of returns undertaken following the March 15 filing and three other major instances, including the percentage depletion provisions, "in which the law itself permits individuals and corporations to avoid their equitable share of the tax burden."

To the use of these and other tax-cutting expedients the treasury attributes the failure of current tax revenues to come up to anticipations.

The percentage depletion provision, Secretary Morgenthau declared, "is perhaps the most glaring loophole in our present revenue law.

"Since 1928," he explained, "large oil and mining corporations have been entitled to deduct from 5 to 27½ percent of their gross income as an allowance for the depletion of their mines or wells, and the deduction may be taken even though the cost of the property has been completely recovered.

"Thus, in 1936, one mining company deducted nearly $3,000,000 under this provision, although it had already completely recovered the cost of its property. The amount of the deduction was a sheer gift from the United States to this taxpayer and its stockholders, and the revenue that we lost thereby was $818,000. Similar annual losses in the cases of a few other typical companies are $584,000; $557,000; $512,000; $272,000; $267,000; $202,000, and $152,000.

Loss Through Deductions

"The estimated annual loss of revenue due to this source alone is about $75,000,000. I recommended in 1933 that this provision be eliminated but nothing was done at that time; and it has since remained unchanged."

Among the eight major types of avoidance involving "moral fraud," the report showed, are personal holding companies, incorporation of yachts and country estates, artificial deductions for interest and losses on loans between members of the same family or from personal holding companies, creation of multiple trusts for relatives and dependents, and family partnerships.

The immediate legislation, the president indicated, should be confined to the plugging of these and other loopholes and should not include new taxes or new rates since, he said, "the treasury will be prepared by next November to present to the appropriate committees information on the basis of which the congress may, if it chooses, undertake revisions of the rate structure."

SEEKS SANCTION

Thompson presents compact to Roosevelt

Washington, D. C.—Initial steps toward congressional sanction of extension of the interstate oil compact was taken May 31 with submission to the white house by Colonel Ernest O. Thompson of the Texas Railroad Commission, as chairman of the Interstate Oil Compact Commission, of the new treaty between the states of Texas, Oklahoma, Kansas, New Mexico and Colorado for a two-year period beginning next September.

In the absence of President Roosevelt, vacationing at his home in Hyde Park, New York, the compact was submitted to his son, James Roosevelt, a member of the white house secretariat.

Purely Waste Prevention Effort

Requesting government approval of the two-year extension, Colonel Thompson pointed out that the compact "is purely a physical waste prevention effort on the part of the signatory oil states, made with the view of providing the means for constant exchange of the latest scientific methods developed in the production of petroleum. It provides a working set-up for a clearing house of ideas and methods for coordinating the police power of the states for a common purpose — that is, preventing waste of this irreplaceable natural resource both above and below ground.

"The science of petroleum engineering is relatively new and the regulatory authorities of the oil-producing states are constantly coming into possession of information covering new methods, practices, circumstances and conditions which aid in the bringing about of conservation and prevention of physical waste in the production of oil and gas."

Concrete results, the commission chairman said, have attended the efforts to reduce waste.

"How well we have progressed in this effort," he said, "is best shown by the fact that during the old days of open flow production perhaps not more than 10 or 15 percent of the oil was recovered from the producing sands, leaving 85 to 90 percent of this petroleum in the ground, never to be recovered by man.

"That wasteful practice caused people in the industry to think oil would play out in 10 or 15 years, whereas now, under enlightened methods of conserving reservoir energy through reduced rates of flow, we are making recoveries as high as 97 percent. This is true conservation.

"Has Worked Admirably"

"The oil states compact has been in operation for the past two years. It has worked admirably and without any friction."

Colonel Thompson expressed the appreciation of the participating states of the "splendid assistance" rendered by Secretary of the Interior Harold L. Ickes, the Bureau of Mines and the conservation division of the interior department, voicing the belief that there is a "complete cooperation and coordination at the present time between the federal government and the oil producing states.

"We are happy to report," he concluded, "that there is a plentiful supply of petroleum in the United States. Great reserves are being uncovered constantly and carefully conserved to the end that gasoline and lubricating oil shall be kept bountifully available for the consumers of this nation."

NATIONAL SCOUTS

Program announced for 1937 meeting in Dallas

Shreveport.—The program of the annual convention of the National Oil Scouts of America which will be held at the Baker Hotel, Dallas, Texas, June 25-26, has been announced by Claude Strahan of Atlantic Refining Company, Shreveport, who is president of the association.

The program follows:

June 25, 9:30 a.m.—Address of welcome, Ben Critz, Dallas Chamber of Commerce. Principal Address, W. R. Boyd, Jr., executive vice president, American Petroleum Institute. Paper on "Recovery of Cased-Off Production" by a representative of The Lane-Wells Company.

Adjournment for noon.

Afternoon—Golf tournament at Lakewood Country Club, competing for J. Edgar Pew Trophy.

Night, 8 p.m.—Stag supper, Peacock Terrace, Baker Hotel.

June 26, 10 a.m.—Paper on Photo Electric Surveys to locate water flows.

Paper on Directional Drilling.

Paper on Water Flooding of Sands.

Adjournment for noon.

2:30 p.m.—Business meeting and election of officers.

9 p.m.—Dinner dance, Peacock Terrace, Baker Hotel.

Entertainment will also be provided for ladies during the convention.

Registration of delegates will begin at noon Thursday, June 24, at the Baker Hotel, mezzanine floor.

SAM F. PRATT, European manager for the Pennsylvania Grade Crude Oil Association with headquarters in London, is slowly recovering from an operation in a London hospital. Pratt formerly represented the association in Baltimore.

Outlook Promising

CURTAILMENT AND MOUNTING CONSUMPTION FIRM MARKETS

ALTHOUGH last week did not bring any important price changes in the oil industry's markets, the outlook was promising; and it appeared that some upward revisions of product prices might be in store.

The markets for both crude and refined oils have been strengthened appreciably by the prospect that crude-oil production will be brought into close conformity with market demand, under the June allowables of the leading producing states.

Consequently, it is indicated that there may occur soon some improvement of tank-car and retail prices of gasoline and some other products. And hope is being revived for a general advance of crude-oil prices this summer, although it is generally felt that such an increase likely would not occur at least for several weeks.

Crude Stocks Finally Drop

The latest available statistics have been predominantly cheerful, revealing that the industry occupies a comparatively favorable inventory position.

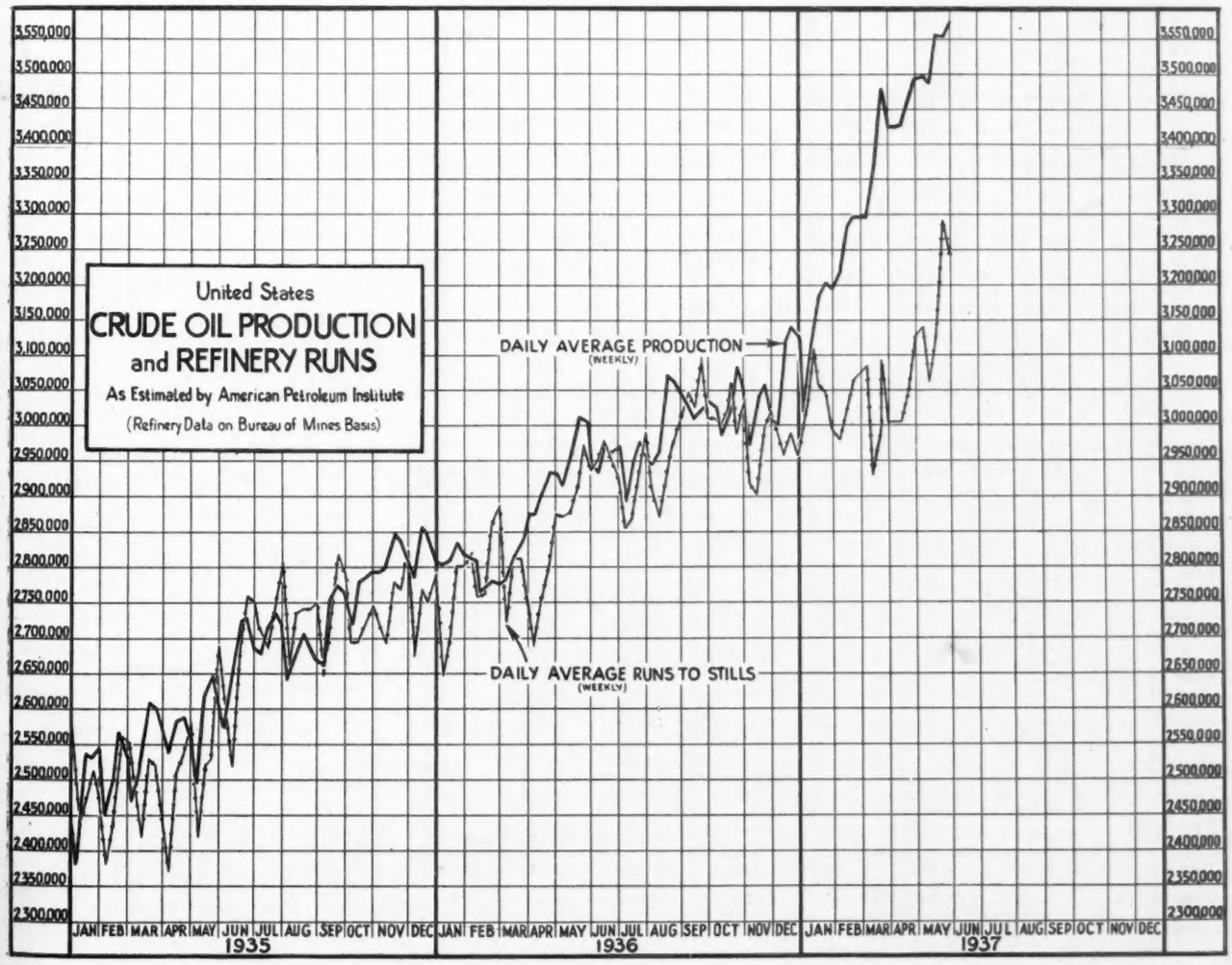
Of particular significance was the report of the Bureau of Mines on crude oil stocks, showing that in the week ended May 22 the long extended running of crude oil to storage finally was interrupted, following 16 weeks of unbroken additions to stocks. The crude-oil inventories in he United States as of May 22 aggregated 304,971,000 barrels, withdrawals of the preceding week having amounted to 394,000 barrels.

Gained 20,000,000 Barrels

In the 16 weeks preceding the 7 days ended May 22, the United States stocks of crude had increased every week. Within that period of 16 weeks, from January 23 to May 15, the crude storage was expanded over 20,000,000 barrels, or from 285,211,000 to 305,365,000 barrels.

The next report of the Bureau of Mines, covering the week ended May 29, however, likely will show a resumption of the additions to crude storage. For in the week of May 29 crude production rose more than 20,000 barrels daily and reached another new all-time peak, while runs to refinery stills showed a decrease of 45,000 barrels daily from the previous week's unprecedented level.

Even for the week ending June 5 it is possible there will be a net addition to



crude oil stocks, as the figures for that week will only partially reflect the stricter allowables ordered effective June 1.

Gasoline Stocks Down

Like the latest report on crude stocks that for gasoline similarly was encouraging, showing a decline. The gasoline inventories for some weeks have been gradually coming down from the all-time peak reached this spring. At 79,498,000 barrels as of May 29, the total stocks of finished and unfinished gasoline in the United States stood approximately 5,000,000 barrels under the peak of March 27. The inventories have been drawn upon gradually, as the season of heavier motoring has advanced.

The latest figure of 79,498,000 barrels, representing the gasoline on hand May 29, indicated that all the supplies of this product are likely to be needed in meeting the expected heavy consumer demand this spring and summer. The May 29 inventories were 11.8 percent greater than the supply of 71,110,000 barrels on hand May 30, 1936. But gasoline consumption this year has been running around 10 percent higher than last year. Thus in relation to consumption, the gasoline stocks of today are no greater than at this time last year, and the supplies a year ago did not prove excessive.

Fuel-oil stocks of the United States for the week ended May 22 increased 1,112,000 barrels. But even with that addition they totaled only 96,223,000 barrels, or approximately 5,000,000 barrels less than the 101,518,000 barrels held one year previously.

The demand for fuel oil has been running substantially higher this year than last year, moreover.

Thus with stocks lower and demand greater, the fuel oil market is in especially good condition, and higher prices are indicated for next fall.

CRUDE PRICES

Complete table of prices paid for crude oil at the well in principal fields will be found on page 70. Hereafter this schedule will appear only in the first issue of each month except when changes are announced.

Kerosene in Demand

Kerosene also has developed into a strong factor in the industry's markets, as plowing activity has expanded demand and tended to push prices higher in some districts of the Mid-Continent.

Tank car prices of gasoline in the Mid-Continent late last week were mostly the same as in the previous week. U. S. motor gasoline f.o.b. Oklahoma refineries was moving with price ranges about as follows: 5⅛ to 5¼ cents a gallon for 62 octane and below; around 5½ cents for 63 to 67 octane; and 6⅛ to 6¼ cents for 68 to 70 octane.

Corresponding prices in the Chicago market were: 5 to 5¼ cents, 5¼ to 5½ cents, and 5⅞ to 6⅛ cents.

In East Texas the usual 60-62, 400 end point gasoline continued at 5¼ to 5⅜ cents a gallon, f.o.b. refineries.

At Oklahoma refineries 41-43 water white kerosene ranged from 4¼ to 4⅜ cents a gallon, and the 42-44 water white grade from 4⅜ to 4½ cents.

In the Chicago market the kerosene tank car prices were one eighth cent a gallon lower on all grades than in the Oklahoma market.

Weekly Trends of United States Production and Stocks

(Figures American Petroleum Institute, except Crude Stocks, Bureau of Mines)

WEEK ENDED	Crude Oil Production (Barrels Daily)	Crude Runs to Stills (Barrels Daily)	Crude Oil Stocks (Barrels)	Gasoline Stocks (Barrels)	Gas & Fuel Oil Stock (Barrels)
January 2, 1937	3,121,400	3,030,000	287,659,000	62,661,000	106,330,000
January 9	3,117,800	3,110,000	286,912,000	65,402,000	105,971,000
January 16	3,184,650	3,045,000	286,044,000	66,559,000	104,841,000
January 23	3,205,150	3,055,000	285,211,000	68,180,000	103,441,000
January 30	3,194,050	2,995,000	285,384,000	69,540,000	102,078,000
February 6	3,220,750	2,980,000	286,116,000	70,535,000	101,136,000
February 13	3,286,050	3,020,000	286,158,000	73,585,000	100,735,000
February 20	3,295,950	3,065,000	287,574,000	74,798,000	99,391,000
February 27	3,296,100	3,085,000	288,121,000	78,786,000	99,534,000
March 6	3,298,800	2,930,000	289,611,000	80,102,000	99,115,000
March 13	3,372,850	2,985,000	290,613,000	81,236,000	98,964,000
March 20	3,448,150	3,095,000	291,555,000	81,623,000	97,287,000
March 27	3,431,300	3,060,000	293,587,000	*83,538,000	96,591,000
April 3	3,422,350	3,005,000	297,374,000	83,157,000	95,805,000
April 10	3,426,300	3,005,000	297,468,000	82,579,000	94,581,000
April 17	3,463,550	3,055,000	298,932,000	82,703,000	94,472,000
April 24	3,496,400	3,125,000	300,737,000	82,303,000	94,100,000
May 1	3,497,450	3,140,000	303,249,000	81,407,000	94,291,000
May 8	3,489,200	3,065,000	304,148,000	81,469,000	94,874,000
May 15	3,551,950	3,135,000	305,365,000	80,378,000	95,316,000
May 22	3,550,450	*3,290,000	304,971,000	79,827,000	95,111,000
May 29, 1937	*3,573,000	3,245,000	.....	79,498,000	96,223,000
May 30, 1936	2,943,950	2,935,000	314,020,000	71,110,000	101,518,000

*All-time peak.

Summary of Wells Completed in the United States Week Ending June 5, 1937

	Completions	Oil Wells	Gas Wells	Failures	Initial Production	Total 1937	Total this Date, 1936
Alabama	.....	.....	.....	.....	.....	1	2
Arkansas	5	2	.....	3	1,003	37	37
California	25	19	.....	6	10,140	559	448
Colorado	.....	.....	.....	.....	.....	6	4
Florida	.....	.....	.....	.....	.....	.....	.....
Illinois	1	1	.....	.....	2,500	38	4
Indiana	.....	.....	.....	.....	.....	45	99
Kansas	74	53	5	16	63,391	1,029	653
Kentucky	10	6	2	2	348	89	117
Louisiana	29	17	2	10	7,417	338	445
Michigan	16	13	1	2	4,040	362	310
Mississippi	.....	.....	.....	.....	.....	6	2
Montana	6	5	.....	1	67	57	51
Nebraska	.....	.....	.....	.....	.....	.....	.....
New Mexico	12	11	.....	1	18,038	300	229
New York	1	.....	.....	1	.....	5	.....
Ohio	29	9	11	9	145	621	829
Oklahoma	66	40	3	23	31,534	1,341	1,167
Pennsylvania	5	3	2	.....	35	73	.....
Texas	369	276	18	75	240,492	6,283	5,300
Utah	.....	.....	.....	.....	.....	.....	.....
West Virginia	20	5	15	.....	26	371	302
Wyoming	4	3	1	.....	3,722	49	20
Total this week	672	463	60	149	382,899	11,610	10,020
Total last week	576	407	43	126	482,316	.....	.....
Total this year	11,610	7,965	969	2,676	9,777,459	.....	.....

West Texas gasoline plant increased

Midland, Texas.—Capacity of Standard Oil Company of Texas' natural gasoline plant in the South Ward County district will be increased from 20,000,000 feet to 35,000,000 feet daily. A surplus of casinghead gas for the area has prevailed since the plant was completed last October. Gasoline production has been mixed with local crude and moved via Atlantic Pipe Line Company's line to Wink, thence through Pasotex Pipe Line Company's system to El Paso. However, Atlantic Pipe Line Company will not have capacity to take care of the increased gasoline yield, and it will be routed via an 11-mile 3-inch welded line built to a tank car rack at Wickett.

Comparison of Permits Granted for New Wells

STATE	Week Ending June 5	Total this Mo.	Total this Year	Total this Date Last Year	1936 Year Total
Arkansas	2	2	74	49	103
California	34	34	667	408	1,054
Louisiana	10	10	510	531	1,107
Kansas	66	66	1,155	767	1,873
Michigan	24	24	409	300	762
Oklahoma	83	83	1,328	1,316	2,594
Texas	319	319	7,882	6,263	15,582
Total	538	538	12,025	9,634	23,075

Curtailment Works

UNITED STATES PRODUCTION DROPS 33,400 BARRELS DAY

MORE effective control of the oil wells of the country was reflected in the decrease that was registered in United States crude oil production during the past week, ended June 5. The output for the nation averaged 3,531,175 barrels daily, or 33,400 barrels a day less than in the previous week.

That rate of production was 195,175 barrels a day greater than recommended by the United States Bureau of Mines for June. But only a part of the week's production was affected by the stricter allowables of June, the earlier portion having fallen under the more liberal allowables of May.

It is indicated, consequently, that a further reduction of the national output is in store for the week just ahead, since the full effect of the stricter allocations then will be felt.

The substantial decline in output for the past week resulted from decreases in Texas, Oklahoma, and Kansas, that more than canceled small increases in California, Louisiana, and New Mexico.

Texas Does Big Share

Texas production averaged 1,401,600 barrels a day, or 22,000 barrels a day less than in the previous week, and was 47,600 barrels daily above the Bureau of Mines recommendation for June. However, the coming week is due to bring a further decline for Texas.

Oklahoma last week declined 18,425 barrels, to 642,350 barrels daily, and was 17,050 barrels above the federal allocation.

Kansas output was down 2750 barrels at 199,925 barrels daily, but exceeded the Bureau of Mines recommendation 9225 barrels daily.

California averaged 660,500 barrels daily, or 4000 barrels a day more than in the previous week and 74,600 barrels a day more than the federal estimate of requirements.

Louisiana showed an increase of 4775 barrels at 248,275 barrels daily, but still was 3725 barrels under the Bureau of Mines recommendation.

New Mexico last week averaged 114,100 barrels daily, 400 barrels more than in the previous week, and 12,100 more than the amount suggested by the federal bureau.

Austin.—Accretions in allowable since the state-wide order was issued have brought the Texas allowable as of June 1 to 1,361,315 barrels.

When the order was issued, the allowable was 1,350,262 barrels, or 4138 barrels less than the consumer-demand figure of 1,354,400 sent to Texas by the Bureau of Mines.

Changes brought about by increases granted since the order was issued, and by the actual East Texas allowable, added 11,053 barrels, bringing the starting allowable to 2138 barrels above market demand.

The special orders for fields each was based on the claim of new markets not now supplied by Texas oil.

Kilgore.—The East Texas field entered the current month with a daily allowable of 463,100 barrels from 22,797 flowing and pumping wells, or an average of 20.31 barrels per well. For proration purposes, the rated hourly flow of the producing wells, which includes 17,220 listed as marginal, is 13,769,406 barrels, according to the Railroad Commission. Prorated wells have been restricted to 2.32 percent of their rated hourly flow since last June 21, This factor will likely be continued for a long period, although the output of the field has climbed 35,729 barrels since it was adopted.

United States Crude Oil Production

Estimates Compiled by The OIL WEEKLY

DISTRICT OR STATE	Bureau of Mines Recommendation (Daily in June)	ACTUAL PRODUCTION: BARRELS DAILY FOR WEEK ENDING June 5	May 29
TEXAS—			
Texas Panhandle	.....	82,890	81,300
North Texas	.....	72,100	73,700
West Central Texas	.....	32,400	32,800
West Texas	.....	203,500	208,300
East Central Texas	.....	118,800	123,400
East Texas Field	.....	463,100	462,400
South Texas	.....	229,400	234,900
Texas Gulf Coast	.....	199,500	206,800
Total Texas	1,354,000	1,401,600	1,423,600
OKLAHOMA—			
Oklahoma City	.....	152,200	165,275
Seminole Area	.....	130,700	101,425
Crescent	.....	12,200	12,125
Lucien	.....	15,400	14,300
Fitts	.....	93,425	101,775
Edmund	.....	21,550	21,200
Moore	.....	13,500	13,100
Others	.....	203,375	231,575
Total Oklahoma	625,300	642,350	660,775
KANSAS—			
Ritz-Canton	.....	5,250	5,200
Chase	.....	8,950	9,475
Hollow-Nikkel	.....	2,573	2,525
Sedgwick	.....	4,275	4,325
Burrton	.....	14,450	15,275
Lorraine	.....	4,600	4,975
Russell County	.....	31,325	31,525
Silica	.....	20,425	22,125
Others	.....	108,075	107,250
Total Kansas	190,700	199,925	202,675
LOUISIANA—			
North Louisiana	.....	80,075	77,000
South Louisiana	.....	168,200	166,500
Total Louisiana	252,000	248,275	243,500
ARKANSAS	28,300	28,025	27,125
CALIFORNIA—			
Long Beach	.....	60,000	60,000
Santa Fe Springs	.....	45,000	43,500
Huntington Beach	.....	35,500	36,500
Dominguez	.....	25,000	23,500
Inglewood	.....	14,000	16,500
Ventura Avenue	.....	34,000	34,500
Seal Beach	.....	9,500	10,000
Midway-Sunset	.....	77,500	74,000
Elwood	.....	9,200	9,000
Kettleman Hills	.....	82,300	81,000
Mountain View	.....	19,000	18,500
Playa del Rey	.....	9,000	9,000
Wilmington	.....	50,000	.....
Others	.....	196,500	240,500
Total California	585,900	660,500	656,500
MOUNTAIN STATES—			
Wyoming	51,000	52,200	53,800
Montana	15,400	16,100	16,200
Colorado	4,800	3,600	3,700
Total Rocky Mountain States	71,200	71,900	73,700
NEW MEXICO	102,000	114,100	113,700
EASTERN STATES	118,200	119,800	118,200
MICHIGAN	38,400	44,700	44,800
Total United States	3,366,000	3,531,175	3,564,575

CRUDE OIL PRICE SCHEDULES

(Figures Revised to June 4, 1937)

MID-CONTINENT GRAVITY SCALE PRICES (Posted January 28, 1937)

(Some fields of Mid-Continent have flat price postings, and are shown separately.)

Gravity	Okla.-Kans.	North La.-Ark.	Rodessa, La.-Tex.	North & W. Cent. Tex.	East Cent. Tex.	Gray Co. Tex.	Carson Hutchinson Co. Tex.	[1]Conroe, Tex. Type	West Tex.-N. Mex.	[2]Gulf Coast (Tex.-La.)	[3]Some La. Gulf Areas	[4]Anahuac, Tex. Type	[5]Refugio, Tex. Type	[6]Mirando, Tex. Type
17–17.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	*$0.90	.....	.....	.....	.....
18–18.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.92	.....	.....	.....	.....
19–19.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.94	.....	.....	.....	.....
20–20.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.96	*$0.90	.....	*$0.95	*$0.90
21–21.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.98	.93	.....	.98	.93
22–22.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.01	.96	.....	1.01	.96
23–23.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.04	.99	.....	1.04	.99
24–24.9	*$0.98	*$0.90	*$0.93	*$0.88	.....	.....	.....	.....	.....	1.07	1.02	.....	1.07	1.02
25–25.9	1.00	.92	95	.90	.....	.....	.....	.....	*$0.78	1.10	1.05	.....	1.10	1.05
26–26.9	1.02	.94	.97	.92	.....	.....	.....	.....	.80	1.13	1.08	.....	1.13	1.08
27–27.9	1.04	.96	.99	.94	.....	.....	.....	.....	.82	1.15	1.10	.....	1.15	1.10
28–28.9	1.06	.98	1.01	.96	*$1.03	.....	.....	*$1.20	.84	1.17	1.12	.....	1.17	1.12
29–29.9	1.08	1.00	1.03	.98	1.05	.....	.....	1.22	.86	1.19	1.14	.....	1.19	1.14
30–30.9	1.10	1.02	1.05	1.00	1.07	.....	.....	1.24	.88	1.21	1.16	$1.16	1.21	1.16
31–31.9	1.12	1.04	1.07	1.02	1.09	.....	.....	1.26	.90	1.23	1.18	1.18	1.23	1.18
32–32.9	1.14	1.06	1.09	1.04	1.11	.....	.....	1.28	.92	1.25	1.20	1.20	1.25	1.20
33–33.9	1.16	1.08	1.11	1.06	1.13	.....	.....	1.30	.94	1.27	1.22	1.22	1.27	1.22
34–34.9	1.18	1.10	1.13	1.08	1.15	*$0.96	*$0.91	1.32	.96	1.29	1.24	1.24	1.29	1.24
35–35.9	1.20	1.12	1.15	1.10	1.17	.98	.93	1.34	.98	1.31	1.26	1.26	1.31	1.26
36–36.9	1.22	1.14	1.17	1.12	1.19	1.00	.95	1.36	1.00	1.33	1.28	1.28	1.33	1.28
37–37.9	1.24	1.16	1.19	1.14	1.21	1.02	.97	1.38	1.02	1.35	1.30	1.30	1.35	1.30
38–38.9	1.26	1.18	1.21	1.16	1.23	1.04	.99	1.40	1.04	1.37	1.32	1.32	1.37	1.32
39–39.9	1.28	1.20	1.23	1.18	1.25	1.06	1.01	1.42	1.06	1.39	1.34	1.34	1.39	1.34
40 & Above	1.30	1.22	1.25	1.20	1.27	1.08	1.03	1.44	1.08	1.41	1.36	1.36	1.41	1.36

* Minimum price and applies also to purchases of lower gravity.

[1] Conroe, Tomball, Satsuma, Raccoon Bend Deep fields.

[2] Upper Texas Gulf Coast, including Goose Creek, Spindle Top, etc., and some fields of Louisiana Gulf Coast, including Black Bayou, White Castle, Vinton, Hackberry, etc.

[3] Choctaw, Darrow, Lockport, Iowa (Magnolia posting), Cameron Meadows, etc.

[4] Anahuac, Dickinson, Flour Bluff, Turtle Bay.

[5] Lower Texas Gulf Coast, including Refugio, Saxet, etc.

[6] Duval, Jim Hogg, Webb, and Zapata Counties; Heyser, Placedo fields.

Mid-Continent Flat Prices

	Flat Price	Date Posted
Arkansas:		
Smackover	$0.90	1–28–37
Louisiana:		
Garden Island	1.37	1–28–37
Lafitte	1.24	1–28–37
Texas:		
East Texas	1.35	5–22–37
Talco	.73	1–28–37
Livingston, Cleveland	1.27	1–28–37
Hardin	1.15	1–28–37
Van	1.10	1–28–37
Pettus	1.37	1–28–37
Pecos County	.91	1–23–37
Pecos Shallow	.81	1–28–37
Luling	1.00	1–28–37
Lytton Springs	1.12	1–28–37
Salt Flat, Darst Creek, Hilbig, Carroll, Clark, Zoboroski	1.09	1–28–37

Michigan Prices

Central Michigan	$1.42	1–29–37

Middle West Prices

Lima	$1.25	1–28–37
Illinois	1.35	1–28–37
Princeton	1.35	1–28–37
Western Kentucky	1.40	1–28–37

Rocky Mountain States Prices

	Flat Price	Date Posted
Elk Basin	$1.30	1–28–37
Frannie Light	.70	11– 4–36
Frannie Heavy	.62	11– 4–36
Grass Creek Light	1.30	1–28–37
Grass Creek Heavy	.62	11– 4–36
Hamilton Dome	.57	11– 4–36
Big Muddy	1.23	1–28–37
Rock Creek	1.20½	1–28–37
Sunburst	1.20	1–28–37
Lance Creek	.97	1–28–37
Osage	1.08	.....
Cat Creek	1.07	8–25–33
Cut Bank	1.35	6– 3–36
Pondera	1.05	9–29–33
Hogback	1.00	9– 8–33

Pennsylvania Prices

Bradford-National Transit	$2.67	2–24–37
Sw. Pa. Pipe Line	2.42	2–24–37
Eureka Pipe Line	2.37	2–24–37
Buckeye Pipe Line	2.22	2–24–37
Corning Grade	1.32	12–18–36

Canada Prices

Petrolia	$2.10	9– 9–33
Oil Springs	2.17	9– 9–33

Mexico Prices

F.O.B. Tampico; net; U.S. Currency, buyer pays tax	$1.24	.....

Major Price Changes

	Penna. (Nat. Tr.)	Mid.-Cont. (36 Gr.)	Calif. (26 Gr.)
June 19, 1933	Up 10	Up 19	.....
June 26, 1933	Up 10	.....	Up 9-12
July 6, 1933	Up 13	Up 10	.....
July 17, 1933	Up 15	.....	.....
July 28, 1933	Up 15	.....	.....
August 11, 1933	Up 10	.....	.....
August 24, 1933	.....	Up 10	.....
August 30, 1933	Up 15	.....	.....
September 6, 1933	Up 10	Up 10	Up 15
September 8, 1933	.....	Up 15	.....
May 1, 1934	Up 10	.....	.....
November 6, 1934	Cut 25	.....	.....
December 6, 1934	Cut 25	.....	.....
January 4, 1935	Up 15	.....	.....
February 4, 1935	Up 15	.....	.....
May 16, 1935	Cut 15	.....	.....
June 26, 1935	Cut 15	.....	.....
July 16, 1935	Cut 10	.....	.....
August 29, 1935	.....	.....	Cut *4
September 6, 1935	Up 5	.....	.....
October 29, 1935	Up 15	.....	.....
November 1, 1935	.....	.....	Up *28
November 18, 1935	Up 15	.....	.....
December 6, 1935	.....	.....	Up *9
January 9, 1936	.....	Up 10	.....
January 13, 1936	Up 15	.....	.....
February 26, 1936	.....	.....	Up †5
December 28, 1936	Up 12	.....	.....
January 28, 1937	.....	Up 12	.....
February 24, 1937	Up 10	.....	.....

* Signal Hill 26 gravity. † Seal Beach 26 gravity.

Crude Production Taxes

Oklahoma—Five percent of gross value less royalty interest.

Texas—2¾ cents or 2¾ percent, whichever is higher.

Louisiana—From four to 11 cents a barrel, depending upon gravity.

Arkansas—2.6 percent of gross market values.

Montana—Two percent of gross value at well and ⅓ of 1c per barrel.

New Mexico—Severance tax of 2 percent on oil and gas.

Wyoming and New Mexico—Production tax based upon state and county assessments.

California—.66443 mills per barrel of oil produced and 17.39 cents per acre on proved oil lands.

IN THE

Financial Field

Stock traders disposed favorably toward oil shares in apathetic market.

* * *

Standard group cash dividend payments running far ahead of last year.

ALTHOUGH the market generally has continued weak and apathetic, traders and investors remain relatively favorably disposed toward the oil company securities.

Consequently, rallies have found the oil shares strong and recessions have found them resistant.

The favor of the oils is based on the industry's present favorable statistical position, prospects for retention of this position, the current and prospective attractive earnings, and the expectations that dividends for 1937 will be comparatively large.

Hedge Against Inflation

Furthermore, there undoubtedly linger some fears of inflation; and oil company securities, representing equities in oil in the ground, naturally are considered as good hedges; since dollars converted into oil would grow if prices, including oil prices, are in the future inflated.

In addition, there apparently remains some opinion that crude-oil prices and product prices are due to show some improvement this summer, and that opportunity exists therefore for profit that might accrue on oil company securities by virtue of such upward price revision.

Stimulating hopes along this line is the present comparatively favorable picture in crude production control, as the June allowables of the leading producing states are relatively strict and indicate better balancing of production with demand.

Cash dividend payments by companies in the "Standard Oil" group for the first half of 1937 will total approximately $120,404,209, compared with $94,689,139 in the corresponding period last year, according to Carl H. Pforzheimer & Company. The combined cash disbursements of the group for the second quarter of 1937 are estimated at $94,966,501, compared with $74,817,051 in the first quarter of 1936. Nearly every company in the group paid larger amounts out this year than last. The larger disbursements for the second quarter reflected particularly the increased payments being made by Standard Oil Company (New Jersey), Standard Oil Company of California, Humble Oil & Refining Company, and Creole Petroleum Corporation.

New Financing

One major oil company lately has revealed it will undertake some new financing, and several others have been contemplating similar action. Since conditions at present are not favorable for offerings, however, it is indicated that further announcements in this respect may be delayed at least for several months.

The new financing is contemplated largely for modernization and enlargement of refineries, although some capital likely will go into the production branch.

The need for capital arises out of the continued growing demand for oils and the added burdens on existing facilities and properties in fulfilling the consumer requirements.

Socony-Vacuum Plans

The plans of Socony-Vacuum Oil Company, Inc., for new financing soon were revealed recently at the annual meeting. J. A. Brown, president of the

CALIFORNIA CRUDE OIL PRICES (Posted February 26, 1936).

(All gravities above those quoted take highest prices of that field.)

Gravity	Signal Hill	Seal Beach Alamitos Heights	Huntington Beach	Inglewood	Playa Del Rey	Olinda Brea Canyon	Athens Rosecrans	Elwood Terrace	Torrance	Richfield	Whittier East Coyote La Habra	Montebello	West Coyote Hills	Santa Fe Springs	New Hall McKittrick Kern River Round Mountain	Mountain View	Midway-Sunset Buena Vista Hills Elk Hills	Lost Hills	Coalinga	Wheeler Ridge
14-14.9	$.80	$.79	$.78	$.79	$.80	$.76	....	....	$.80	$.76	$.76	$.77	$.78	.....	$.70	....	$.70	$.70	$.70	....
15-15.9	.80	.79	.78	.79	.80	.76	....	....	.80	.76	.76	.77	.78	.....	.70	....	.70	.70	.70	....
16-16.9	.80	.79	.78	.79	.80	.76	....	....	.80	.76	.76	.77	.78	.....	.70	....	.70	.70	.70	....
17-17.9	.80	.79	.78	.81	.80	.76	....	....	.80	.76	.76	.77	.78	.....	.70	....	.70	.70	.70	....
18-18.9	.80	.79	.78	.84	.80	.78	....	....	.82	.76	.76	.77	.78	.....	.70	....	.70	.70	.70	....
19-19.9	.82	.79	.82	.87	.84	.81	....	....	.85	.76	.78	.77	.78	.....	.70	$.70	.74	.74	.71	$.70
20-20.9	.85	.79	.85	.90	.88	.84	....	....	.88	.78	.82	.77	.80	.....	.....	.70	.78	.78	.72	.70
21-21.9	.88	.79	.89	.93	.93	.88	....	....	.91	.80	.85	.77	.84	$.78	.....	.73	.82	.82	.74	.70
22-22.9	.92	.82	.92	.96	.98	.92	....	....	.93	.84	.89	.79	.88	.78	.....	.77	.87	.86	.78	.72
23-23.9	.95	.86	.96	.99	1.02	.96	$.84	....	.96	.88	.93	.82	.92	.78	.....	.80	.92	.90	.82	.76
24-24.9	.99	.91	1.00	1.02	1.06	.99	.88	....	.99	.91	.96	.85	.96	.82	.....	.84	.97	.94	.86	.79
25-25.9	1.03	.95	1.03	1.05	1.11	1.03	.93	....	1.02	.95	....	.89	.99	.86	.....	.88	1.01	.98	.90	.83
26-26.9	1.06	1.00	1.07	1.09	1.16	1.06	.98	....	1.05	.98	....	.92	1.03	.90	.....	.91	1.06	1.02	....	....
27-27.9	1.10	1.05	1.11	1.12	....	1.10	1.03	....	....	1.02	....	.96	1.06	.95	.....	.95	1.10	1.06	....	....
28-28.9	1.14	1.10	1.14	1.15	....	1.14	1.07	....	....	1.06	....	.99	1.10	.99	.....	.99	1.15	1.10	....	....
29-29.9	1.17	1.15	1.18	1.18	F.O.B.	1.17	1.12	....	....	1.09	....	1.03	1.14	1.03	.....	1.02	1.20	1.14	....	....
30-30.9	1.21	1.19	1.22	1.21	Pipe	1.21	1.17	F.O.B.	....	....	....	1.07	1.17	1.08	.....	1.06	1.25	1.18	....	....
31-31.9	....	.....	....	1.24	Line	1.24	1.22	Ship	Kettleman Hills			1.11	1.21	1.12	.....	1.09	1.29	....	....	....
32-32.9	....	.....	....	1.27	....	1.27	1.27	....	1.19			1.14	1.25	1.16	.....	1.13	1.34	....	....	....
33-33.9	....	.....	....	....	....	....	1.32	$1.28				1.18	1.28	1.20	.....	1.17	1.38	....	....	....
34-34.9	....	.....	....	....	....	....	1.37	1.32	....	1.23	....	1.22	1.32	1.25	.....	1.20	.....	....	....	....
35-35.9	....	.....	....	....	....	....	1.42	1.35	....	1.27	....	1.25	....	1.29	.....	....	.....	....	....	....
36-36.9	....	.....	....	....	....	....	1.46	1.39	....	1.31	....	1.29	....	1.33	.....	....	.....	....	....	....
37-37.9	....	.....	....	....	....	....	1.51	1.43	....	1.35	....	1.32	....	1.37	.....	....	.....	....	....	....
38-38.9	....	.....	....	....	....	....	1.56	....	....	1.39	....	1.36	....	1.42	.....	....	.....	....	....	....
39-39.9	....	.....	....	....	....	....	1.61	....	....	1.43	....	1.40	....	.....	.....	....	.....	....	....	....
40-40.9	....	.....	....	....	....	....	1.66	....	....	....	....	1.43	....	.....	.....	....	.....	....	....	....

company, said that the requirements of the concern for capital expenditures of various kinds on its properties are high, and that the management believes these expenditures are in the best interests of the stockholders. The necessary funds for the purpose therefore should be provided, he said.

Details of the financing have not been announced, but it is indicated that substantial funds would be involved. If the company issues convertible debentures, bonds, or stock, it is said, preferential rights to subscription will be extended to present stockholders.

At the Socony-Vacuum meeting the estimate was made officially that the company earned about $12,900,000 in the first quarter of 1937 compared with $7,160,000 in the similar period of 1936. It was pointed out that estimates of probable earnings in the remaining quarters of this year are difficult to make, and that there will likely be manifested some effects of rising costs that now are encountered in all industry.

Of the total net worth of Socony-Vacuum, amounting to about $645,000,000, it was said that $174,000,000 or 30 percent represents foreign assets. The company operates in all countries outside Russia, and has some investment in nearly all countries.

Directors of the Socony-Vacuum company were reelected at the annual meeting.

Pure Oil Calls Notes

Pure Oil Company has called for redemption July 1 the outstanding balance of $28,500,000 of 15-year 4¼ percent notes. This action has been taken in connection with a refinancing program. The company will offer $46,945,540 of a new $100-par cumulative convertible preferred stock. Proceeds will be used for redemption of the above mentioned notes, and 76,620 shares of 8 percent cumulative preferred stock, to pay off bank loans of $4,000,000, and for capital expenditures, especially in the refining department.

Cosden Petroleum

In May, its first month of operation since reorganization, the Cosden Petroleum Corporation showed gross income of about $100,000, before interest, depreciation, depletion and federal income taxes, according to J. S. Cosden, president. The company plans to build a new cracking unit, and expects to be able to do so without the need for new financing.

Lion Oil Refining

Lion Oil Refining Company and subsidiaries, exclusive of the recently acquired E. L. Smith Oil Company, reported for the first three months of 1937 profits of $175,252, after charges but before income taxes. That compared with profit of $107,956 in the similar period last year.

The company and all its subsidiaries for the 4 months ended April 30, 1937, showed profit of $305,290 after depreciation, depletion, etc., but before income taxes. That compared with profit of $151,806 in the similar period of 1936. The April, 1937, profit, on the same basis, was $130,038, before income taxes.

South Penn

South Penn Oil Company directors have voted an extra disbursement of 37½ cents in addition to the regular quarterly dividend of 37½ cents a share on the common stock. On March 31 this year the the company paid an extra of 22½ cents in addition to the regular dividend.

Texon Oil & Land

Texon Oil & Land Company has declared the regular quarterly dividend of 15 cents on the common stock. Group No. 1 Oil Corporation, controlled by Texon Oil & Land Company, will make a payment of $50, the same as that paid April 1.

Panhandle Eastern

Panhandle Eastern Pipe Line Company and subsidiaries report for the 12 months ended March 31, 1937, balance available for common stock of $1,513,867, after preferred dividends.

Standard Gas

Standard Gas & Electric Company and subsidiaries, excluding Deep Rock Oil Corporation and Beaver Valley Traction Company and their subsidiaries, reported for the year 1936 net income of $4,058,785, after federal income taxes, depreciation, depletion, interest, amortization, dividends on subsidiary preferred and common stocks held by the public, and other charges. That compared with consolidated net income of $2,454,143 for 1935.

The Standard Gas & Electric Company, parent company only, for 1936 reported net income of $2,116,801 after taxes, interest, amortization, etc., compared with $2,117,048 in 1935.

United Gas

United Gas Corporation and subsidiaries, controlled by Electric Power & Light Corporation, report for the 12 months ended March 31, 1937, net income of $11,371,207, after federal income taxes, interest, property retirement, depletion, subsidiary preferred dividends, minority interests, and federal surtax on undistributed profits. That compared with net income in the preceding 12 months of $6,758,580. For the three months ended March 31, 1937, net income was $4,439,578, after federal taxes and charges, compared with $3,990,776 in the corresponding period of 1936.

Creole Petroleum Corporation

At the annual stockholders' meeting of Creole Petroleum Corporation E. Holman, president, stated that the company's earnings this year should be running a little better than last year, because of better average prices the company is receiving for Venezuela crude oil.

The company at present is receiving an average price of 89 cents a barrel for crude oil, compared with 83 cents a barrel in 1936 and 75 cents a barrel in 1935.

W. P. Mook was elected a director of Creole Petroleum Corporation, succeeding F. H. Kay, and the remaining directors were re-elected.

Louisiana Land

Louisiana Land & Exploration Company for the first six months of 1937 likely will show net profit of about 35 cents a share on the capital stock. This was stated by E. B. Tracy, president, at the annual meeting of stockholders. In the first half of 1936 the company had a profit of $499,500, after charges, equal to 16 cents a share.

The company's gross production in the first three months was 3,186,362 barrels, compared with 2,973,000 barrels in the similar period last year. Present output is 35,000 barrels daily from 110 wells.

Pan American Petroleum

Pan American Petroleum and Transport Company for the first three months of 1937 reported a net profit of $869,948, or 18 cents a share. This compares with $607,844, or 13 cents a share in the similar period last year. This company is controlled by Standard Oil Company (Indiana), and it has refineries at Baltimore, Savanah, Georgia, and Texas City, Texas. The company has distributing stations in the eastern half of the United States.

Plymouth Oil

Plymouth Oil Company for the second quarter of 1937 probably will show a substantial gain in earnings over those in the first quarter of the year. This was indicated by Walter S. Hallanan, president, at the annual meeting of stockholders. The company in the first three months of 1937 reported profit of $640,319, after usual deductions. That was an increase of 77 percent over the similar period in 1936.

Hallanan stated that the oil industry should benefit from the general movement toward reduced number of working days and fewer working hours daily, since this movement will increase consumption of gasoline and other oils. He stated that people will spend some of the added leisure time in motoring.

A. B. Dally, Jr., of Pittsburgh, was elected a director of Plymouth Oil Company to fill vacancy caused by the death of J. G. Farquhar.

Texas Gulf Producing

Texas Gulf Producing Company for the first three months of 1937 reported net profit of $220,442 after usual deductions, equal to 25 cents a share on the capital stock. This compares with $210,111, or 23 cents a share, earned in the similar period of 1936.

Transwestern Oil

Transwestern Oil Company for the three months ended March 31, 1937, reported profit of $113,553, after depreciation, depletion, etc., but before federal taxes. The company in March had net daily average production of 8057 barrels, compared with 6847 barrels daily in January.

Derby Oil and Refining

Derby Oil & Refining Corporation for the first 4 months of 1937 reported profit of $193,653, after depletion, and depreciation, but before federal taxes. This compares with $53,126 earned in the similar period of 1936.

El Paso Natural Gas

El Paso Natural Gas Company and subsidiaries report for the 12 months ended March 31, 1937, net income of $1,289,533, after usual deductions, compared with 543,699 in the previous 12 months.

Edited by
WM. V. GROSS, Associate Editor

West Flank Fizzle

IMPORTANT TEST IN TURNER VALLEY FAILS TO GET OIL

SPUDDING Royal Canadian Oils' test and decision of Royalite Oil Company officials to abandon Dalhousie 8, featured developments in Turner Valley last week.

Location of the Royal Canadian well in Legal Subdivision 15, Section 20, Township 18, was selected by Dr. Frank Henderson, Vancouver geologist. It is ½-mile southwest of the large B. & B. Royalties producer and on a 40-acre lease cornering that of Monarch Royalties. Union Drilling Company has the contract and cable tools will be used to 3500 feet. It was drilling below 150 feet as the week closed.

Decision to abandon Dalhousie 8 was made following unsuccessful production tests of the Dalhousie sands. Located on Legal Subdivision 6, Section 30, Township 19, on the west flank of Turner Valley, it was shot with 1000 quarts of nitroglycerine in the limestone several weeks ago. The well bridged over a few hundred feet from the bottom and later the drill stem twisted off and efforts to fish it out were unsuccessful. Tests of the Dalhousie sands were made in a last, but unsuccessful, effort to bring the well into production.

To Get Another Trial

Brown Oil Corporation will make a further test of the west flank with No. 3 on Legal Subdivision 1, Section 19, Township 19, about a half mile southeast of Dalhousie 8, and a half mile south of Advance Petroleum's No. 5, crude producer now doing about 1200 barrels a month after coming in as a naphtha well in 1930. Derrick was completed last week and the well will be spudded without delay. Six companies are cooperatively engaged in the test.

Richland Oil Company's No. 3 and Monarch Royalties are holding the Turner Valley spotlight, both scheduled for early completion. At the Richland well, substantial oil and gas showings were encountered in the lower Dalhousie sands. It is cemented at 5440 feet and casing is being run with more than 2000 feet of oil in the hole. The limestone is expected at 5700 feet.

Monarch Royalties was drilling below 5660 feet as the week closed. It reached the top of the Blairmore at 5090 feet, and is expected to reach the Madison limestone at 6500 feet. Anglo-Canadian Drilling & Development Company is doing the drilling with rotary equipment.

Derrick for Home Oil Company's test on Legal Subdivision 8, Section 33, Township 20, has been started and rotary equipment will be used. The location is two miles southwest of Millarville and two miles north of Phillips Petroleum Company's test, drilling at 2700 feet as the week closed.

Pincher Creek Due to Complete

Cement plug in Weymarn Petroleums Ltd.'s wildcat on Pincher Creek structure, Legal Subdivision 5, Section 7, Township 6, installed from 4500 to 4725 feet to halt caving has been drilled through and officials expressed hope to have the well on production test within a week. Paul Von Weymarn, president of Weymarn Petroleums, reported that little but crude oil was being brought to the surface by the bailer.

Arca Development Company's wildcat on the High River-Aldersyde structure, which had been drilled to 8988 feet, deepest of any British Empire test, a cement plug installed to halt intrusion of sulphur water from the lower limestone was drilled through and fluid is being removed. The test will exhaust possibilities of production from the Dalhousie sands at about 8600 feet.

In the new Taber oil field, Plains Petroleum Company's No. 2 has been spudded and was drilling below 60 feet as the week closed. Location is 1320 feet south of No. 1, discovery well. Production at the discovery well has been cased-in to localize the water condition and the hole has been deepened to 3271 feet. Thickness of the producing sand has been found to exceed 75 feet. The company has chosen location for its No. 3 well about a mile west of No. 2.

Lethbridge Petroleums spudded on the Lethbridge structure during the week. Empire Drilling Company, Limited, has the drilling contract.

Anaconda Oil Company, Limited, will spud on the Steveville structure within the next two weeks. Location is Legal Subdivision 15, Section 9, Township 22, and cable tools will be used.

To Drill Near Duke's Ranch

Firth Petroleums, Limited, is planning to drill a test northeast of the Duke of Windsor's E. P. Ranch, while Golden Gate Oils, Limited, will drill a test south of the ranch. Location of the Golden Gate test is the southeast quarter of Section 12, Township 16, and the company is being financed by a group of Chinese merchants at Vancouver.

Highwood-Sarcee Oils, Limited, announced it has secured from the Dominion government a prospecting permit covering 48 sections on the west side of the Sarcee Indian Reserve. Exploration work will follow during the summer months.

The standing at Turner Valley wells as the week closed follows: Brown Oil Corporation's No. 1, drilling at 3235 feet; No. 2, drilling at 3145 feet; No. 3, derrick up; Command Oils, drilling at 320 feet; Commoil, drilling at 3305 feet; Davies Petroleum's No. 1, drilling at 2000 feet; No. 2, drilling at 3730 feet; Firestone Petroleums, drilling at 2060 feet; Four Star Petroleums, drilling at 1965 feet; Globe Oil Company, drilling at 1385 feet; Granville Oil Company, drilling at 3255 feet; Kermac Petroleums, derrick up; Mercury Royalties, drilling at 3000 feet; Mercury Oils No. 8, drilling at 2940 feet; Model-Spooner-Reward Royalties, reaming at 1805 feet; Monarch Royalties, drilling at 5660 feet; Mutual Oil Company, derrick up; National Petroleum Corporation's No. 1, drilling at 650 feet; No. 2, drilling at 1725 feet; North American Petroleums, spudded; Phillips Petroleum Company, drilling at 2700 feet; Prairie Royalties, drilling at 3435 feet; Richland Oil Company's No. 1, drilling at 2740 feet; No. 2, drilling at 4030 feet; No. 3, cemented at 5440 feet; Rich-Well, cementing at 620 feet; Royal Crest Petroleums, drilling at 2640 feet; Royal Canadian Oils, drilling at 150 feet; Share Royalties, drilling at 3585 feet; Royalite Oil Company's Sterling-Pacific 5, drilling at 4769 feet; Sterling-Pacific 6, derrick up; Sunburst Oils, drilling at 2065 feet; Sunset Oils, drilling at 2005 feet; Three Point Petroleums, drilling at 2010 feet; West Flank Petroleums, drilling at 833 feet.

OKLAHOMA FIELDS

More tests of third sand at Tonkawa scheduled.

* * *

Potential of 18,782 barrels given Moore pool well.

* * *

Continental outpost extends Jesse pool to north.

Oklahoma City.—Action of the Oklahoma Corporation Commission in postponing its hearing on the petition to classify the third Tonkawa sand of the Oklahoma City field as a common source of supply has stimulated activity of well owners to make further tests of the formation. The petition of Indian Territory Illuminating Oil Company to gain the common source of supply designation was set down for May 28, but the hearing was reset for June 24.

This company's Theimer 2, NW SW NE, 1-11n-3w, only well to plug back from Simpson formation and perforate at the third Tonkawa level, was given 15,000 barrels output during June as a discovery right. The attitude of the commission was that no action be taken until further tests had been made to give some indication of the area this fifth producing horizon will include.

Meanwhile Indian Territory Illuminating Oil Company began plugging back Theimer 5, NW SE SE 1-11n-3w, to perforate and test the third Tonkawa. This well is a half mile north of Theimer 2. Phillips Petroleum Company is plugging back Lowery 7, NL SE NW 12-11n-3w, to test the Tonkawa sand member. Cromwell-Franklin Oil Company et al's Trosper Park 9, S½ NE SE NW 12-11n-3w, is being plugged back for a similar test.

Moore Pool Extended

Production of the Moore Pool, Cleveland County, was moved one location northward June 3 by partial completion of Anderson-Pritchard Oil Corporation's State 3 which cut a connection while cleaning itself. The well entered Wilcox sand at 7226 feet, 22 feet lower than the next well south, and drilled to 7285 feet. It was open for only 4 minutes and flowed mud, oil and sand. Gas pressure increased from 30,000,000 to 50,000,000 feet. Total depth is 7285 feet.

Anderson-Prichard Oil Corporation has made location for a test one location to the north while Stanolind Oil & Gas Company and Amerada Petroleum Corporation is building a derrick for a west offset.

Final completion, which will be made as soon as flow equipment can be prepared, will give the field 25 producing wells. This well found top of the Wilcox sand only 21 feet lower than the Moore discovery well a mile to the south. Total depth comparisons, however, indicate a thinner sand body as the discovery well was drilled to 7291 feet, 6 feet deeper than the latest producer.

Gets High Potential

Sinclair Prairie Oil Company's Bagby 4, SE SW NW 27-10n-2w, in the Moore pool, Cleveland County, established a 24-hour potential of 18,782 barrels of oil, coming from the Wilcox sand 7278 feet. Hourly gauges on the well were 1002 barrels the first hour, 800 barrels the second hour, 756 barrels the third hour and 792 barrels the fourth hour.

In the Langston Townsite pool, where citizens have been fighting regulation by the state corporation commission, a test was being abandoned. It was Rayden Oil Company's Stroud 1, in Block 92 of the townsite. The well had Wilcox sand from 5228 to 5257 feet, the total depth, but it was dry. It checked 160 feet lower than the discovery well.

Ohio Oil Company's Dahl 14, SW NE SE 31-14n-3w, in the Edmond pool, established a 24-hour potential of 17,743 barrels of oil along with 30,000,000 cubic feet of gas. Production was from between 6420 and 6640 feet in the Wilcox sand following a shot with 192 quarts.

Possibilities of a northwest extension of Billings pool, Noble County, were dimmed last week as Continental Oil Company's Conway 2, NEc NW 21-23n-2w, swabbed for eight hours and made only 50 barrels of oil. Top of the Wilcox sand was found at 4297 feet, and the well was drilled to 4314 feet with seven-inch casing set at 4298 feet. After drilling plugs the well made a few small flows in five hours, and one small head flow after having been shut in overnight.

Well three miles from Fitts gets Cromwell sand oil

Tulsa.—Other than a short extension of the Jesse pool and the planning of extensive tests for Cromwell sand production in the Fitts field, activity was at an unusually low ebb in the Tulsa district last week.

Continental Oil Company's Thompson 1, NWc SE 2-1n-7e, pushed the north edge of production ahead in the Jesse pool of Pontotoc County last week. The well topped Bromide sand at 4432 feet, drilled to 4621 feet, and was plugged back to 4036 feet. Seven-inch casing was cemented at 3732 feet and mud was swabbed from the hole. It was acidized with 5000 gallons between 3732 and 3772 feet and responded with a flow of 434 barrels of oil in three hours, with no water showing. Gas was estimated at 1,000,000 cubic feet, and the well was shut in. The company may accept a daily allowable of 100 barrels of oil, eliminating the necessity of a potential test.

Extensive tests are in prospect for Cromwell sand production in the Fitts field as a result of findings at Roodhouse et al's Booth 1, SE NW SE 20-2n-6e, three miles northwest of the field proper. Top of the sand was found at 3087 feet, and a core from 3090 to 3103 feet had a recovery consisting of 9½ feet of saturated sand. The formation was found higher than in the producing wells on the west side of Fitts.

H. L. Blackstock's Thompson 1, NEc 4-1n-7e, in the Muse area south of Fitts, made 20 barrels of oil from Viola lime. Operators were starting a test after the well had drilled through the first Bromide sand to the second pay. Oil was showing at 4576 feet in the second Bromide.

Good Well at Fitts

In the Fitts field, E. H. Moore's Smith 8-B, NW NE NE 32-2n-6e, topped the Hunton lime at 3376 feet; topped the Sylvan shale at 3670 feet and was bottomed in the formation. Acidized with 10,000 gallons it made a 24-hour potential of 3200 barrels of oil from the Hunton Lime.

Skelly Oil Company's Metropolitan Life Insurance Company 11, SEc SW 23-2n-7e, topped the Hunton lime at 3608 feet and drilled to 3878 feet where it made 1374 barrels of oil during a 24-hour potential test. It had 1,734,000 cubic feet of gas.

Magnolia Petroleum Company's Norris 1, SEc 21-2n-7e, topped the Hunton lime at 3725 feet and drilled to 3765 feet where it flowed 650 barrels of oil in three hours, the first hour through casing and the last two through tubing.

Hughes County Wildcat Shows

In Hughes County, Carter Oil Company et al's Hamilton 1, CWL NE SW 33-4n-9e, near Citra, cored from 5934 to 5942 feet and recovered four feet of lime with shale streaks showing gas. Drilled to 5982 feet in the McLish sand, the well took a test after setting packer at 5945 feet. Opened three hours, it showed some 700 feet of oil in the hole and about 400 feet of oil-bearing mud. Seven-inch casing was run to 5945.

Carter Oil Company et al's Thompson 1, CS½ NE NW 34-2n-9e, long-

lived well in the Centrahoma area of Coal County, bailed down to 6330 feet and had 200 feet of oil in the hole early in the week. Casing was perforated between 6200 and 6235 feet and again between 6140 and 6180 feet and the hole filled 350 feet with oil.

Mid-Continent Petroleum Corporation's Logan 1, NEc SE 31-11n-5e, east of the Shawnee pool in Pottawatomie County, pumped 200 barrels of oil and 65 barrels of water in 24 hours. It topped the Wilcox sand at 4839 feet and drilled to 4844 feet. In the following two days, the well made 388 barrels of oil and 130 barrels of water.

Court allows back allowable

Oklahoma City.—By decision of the Oklahoma Supreme Court, British American Oil Producing Company gained the privilege of an adjusted potential for its Mary Green 1, discovery well of the north extension of the Oklahoma City field. The action was an appeal to the court from an order of the Oklahoma Corporation Commission.

The result of the decision is that the well may have back allowable for the period between October 1 and December 26, 1935.

Records submitted for the court were to the effect that this well as drilled into the sand October 1, that it was shut in that day in order to install safety equipment, that it was opened the next day and produced 2000 barrels of oil in 10 hours, that it remained shut in from that date to October 7, during which period gas escaped from the oil column, which resulted in the well not flowing, that upon swabbing the hole October 8, equipment broke and a fishing job resulted.

A potential test finally was made December 26. The order of the commission fixed the allowable from that date.

OKLAHOMA
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
ATOKA COUNTY—		
A. J. Sanders, Redman 3, se sw sw 19-1n-15e	*	1275
CARTER COUNTY—		
Carl Carter, Gray 1-A, se ne ne 10-1s-3w	*	1063
Schermerhorn Oil, Fee 33, se sw nw 5-4s-3w (otd 1085)	45	1107
Fee 34, nw nw nw 5-4s-3w (otd 1100) (pb 1109)	12	1120
Shell, McClure 48, sw se nw 5-4s-3w (pb 990)	6	1172
Carter, H. Z. Ward 41, cs½ ne nw 6-4s-3w	35	1140
COTTON COUNTY—		
Shasta O&G, School Land 2, cs½ n ½ sw 36-1s-10w	9	2178
School Land 3, sw ne sw 36-1s-10w	8	2180
School Land 4, sw nw se 36-1s-10w	*	2245
CREEK COUNTY—		
Shaw, Doke & Hughes, Yarhola 2, ne ne ne 25-17n-7e	¶3½	1026
Freeland et al, Dresser 1, cne sw 16-17n-8e	*	2374
GARVIN COUNTY—		
Stevens & O'Dell, Newberry 1, nw se sw 14-1n-3w	4	1734
Winkler & McQueen, Perkins 3, sw sw ne 32-1n-3w	98	2448
Carter Oil, Parton 1, nw se nw 33-1n-3w (pb 2290)	12	2615
GREER COUNTY—		
Neff & Godfrey, Melton 1, se nw se 16-3n-22w	*	4522
HARMON COUNTY—		
Penn Oil Corp., Cole 1, cw½ sw nw 21-2n-26w	*	5575
JEFFERSON COUNTY—		
Olson, Heenan et al, Rose 1, csw sw 1-5s-5w	*	5024
KIOWA COUNTY—		
Westbrook & Liking, Aetna Life Ins. Co. 1, ne se se 9-5n-16w	*	495
LINCOLN COUNTY—		
Stanolind-Amerada, Arinwine 1, se nw se 35-15n-2e	31	5100
Skelly, Sporn (South) 1, ne se se 20-17n-3e	¶1 & 297	4618
LOGAN COUNTY—		
Continental, McConnell 6, sw sw se 28-17n-4w (pb 6155)	*	6574
Phillips & Shell, Hackett 2, sw ne se 21-23n-2w	1609	4341
NOBLE COUNTY—		
Tide Water Oil, Hackett 5, sw nw se 21-23n-2w	¶2¾ & 3996	4326
OKFUSKEE COUNTY—		
Champlin, Maudie 2, se sw sw 7-10n-9e	4	1873
Delaney et al, School Land 1, sw sw sw 8-10n-9e	45	1916
Arkansas Royalty, Brooks 3, nw ne sw 18-10n-9e	35	1872
Brooks 5, ne se sw 18-10n-9e (pb 1899)	65	1902
Chapman, Dunn, 2, ne nw nw 18-10n-9e	10	1885
Sinclair Prairie, Cohee 1, nw sw nw 19-10n-9e	65	1896
Fisher 10, se nw sw 19-10n-9e	125	1896
Palmer 5, nw ne nw 19-10n-9e (pb 1915)	10	1918
Snyder et al, Wind 9, ne sw ne 35-11n-9e	18	1487
OKLAHOMA COUNTY—		
Jones & Shelbourne, Mitchell 1, se se sw 15-12n-3w	120	6455
Sunray & Phillips, State 14, nw sw ne 27-12n-3w	4558	6525
Anderson & Kerr, Minnis 1, se ne ne 34-12n-3w	315	6410
Big Chief & Farris, Park Plack 1, ne se ne 35-12n-3w	330	6420
OKMULGEE COUNTY—		
Downing, McIntosh 10-A, ne ne ne 1-15n-14w	*	1405
Devonian Oil, Tiger 4, cwl sw sw 24-16n-12e	¶1	1825
OSAGE COUNTY—		
Mason & Carter 3, se sw ne 23-21n-8e	*	1405
Norbla Oil, 1, ne ne sw 13-23n-6e	*	2825
Kewanee O&G, 2, ne se sw 27-26n-6e	*	2951
I. T. I. O., 382, sw sw se 34-27n-11e (otd 1850)	¶3½	2115
PONTOTOC COUNTY—		
Moore, Akers 14, nw se ne 36-2n-6e	¶3¼ & 2195	3710
Ingram 2, sw ne ne 22-2n-7e	¶3¼ & 4027	3898
Wooley-Burris 1-A, csl n½ s½ 22-2n-7e	¶½ & 473	4391
Skelly & Phillips, Metropolitan Life "C" 1, se nw se 23-2n-7e	¶6½ & 3359	4017
Amerada, Smith 7, ne sw nw 28-2n-7e	2466	3568
Moore, Harper 2-B, se sw ne 29-2n-7e	¶2½ & 1110	3610
Harper 3-B, ne sw ne 29-2n-7e	67	2690
Loual Drlg., Hardin 7, ne nw nw 30-2n-7e	¶3¼ & 1779	4405
Magnolia, Hardin 13, ne ne nw 30-2n-7e	¶2½ & 2247	4400
POTTAWATOMIE COUNTY—		
E. W. Jones, Junk 1, ne se nw 5-10n-4e	*	4496
Mid-Continent, J. S. Logan 1, ne ne se 31-11n-5e	180	4844
Tom Phillips et al, Cossey 1-A, cw½ se ne 23-11n-6e (pb 4565)	*	4620
SEMINOLE COUNTY—		
Sinclair Prairie, Kouri 2, sw se se 13-7n-6e (pb 3280)	*	4163
Scroggins, Davis 1, sw ne sw 34-7n-6e	*	820
Magnolia, Carolina 2, sw sw nw 14-8n-7e (otd 3185)	*	3380
Sinclair Prairie, Raitman 3, sw se nw 18-9n-6e (pb 3340)	*	4206
Amerada et al, Riddle 2, se nw ne 2-10n-5e	1608	4624
Amerada-Stanolind, Reed 1, se sw se 19-10n-8e	*	3618
STEPHENS COUNTY—		
Carl Carter, Harley 8, cel ne 24-2s-4w	6	432
Harley 9, cel ne 24-2s-4w	5	432
Edwards, Frederick 1, ne se nw 31-2n-8w	*	2800
TILLMAN COUNTY—		
Lynn Olive, Reiling 1, se se sw 22-1s-15w	*	1387
TULSA COUNTY—		
Anthony, Wilcox 4, ne nw nw 3-16n-12e	150	2295
Klingensmith, Gilcrease 3-A, sw se sw 34-17n-12e	*	2294

*Failures; †Junked; ¶Million cu. ft. gas.

Eight Oklahoma wildcat tests quit during week

Tulsa.—One wildcat of major importance and failures in eight different counties were all Oklahoma had to offer in the way of exploratory drilling last week. The new test is in the maligned Centrahoma area of Coal County, and is being supported by seven major oil companies.

The well is Carter Oil Company's et al's Clayton 1, CW½ NE SW 27-2n-9e, which will be a Bromide sand test. Supporting the venture, with Carter as operator, are Stanolind Oil & Gas Company, Skelly Oil Company, Continental Oil Company, Phillips Petroleum Company, Ramsey Petroleum Company and the John Maybe interests. The concerns have a 1036-acre block in the area, centering in Sections 26, 27 and part of 28-2n-9e. The test, which is still a location, is one township north of Carter Oil Company et al's Thompson 1, which was bailing to test the Viola lime.

Southern Oklahoma, where most current wildcatting is being done, bore the brunt of the disappointing reports. In Tillman County, Eugene Skinner's Lynn Oliver 1, 22-1s-15w, several miles northwest of Chattanooga, was abandoned. The well was started June 30, 1936, and after going ahead in spurts for almost a year, was stricken from the list of active wells.

Farther south, in Jefferson County, Olson, Heenan & Coe's Rose 1, CSW SW 1-5s-5w, a rank wildcat, was dry at 5024 feet. Stephens County lost two tests. H. J. Edward's Frederick 1, NE SE NW 31-2n-8w, in a small gas area near Nellie, quit at 2754 feet, where it had water. Penn State Oil Company's Cole 1, CW½ SW NW 21-2n-6w, southwest of Bray, was dry at 5575 feet.

Amerada Petroleum Corporation and Stanolind Oil & Gas Company abandoned Reed 1, SE SW SE 19-10n-8e, at 3618 feet. It was west of the Cromwell pool. In Atoka County, A. J. Sanders' Redden 3, SE SW SW 19-1n-15e, was abandoned at 1260 feet. The test had a show of oil around 932 feet, but was drilled ahead in the hope of finding commercial production.

In Greer County, Nelf, Godfrey and Andrea's Melton 1, CSE NW SE 16-3n-22w, at the south end of the county, was dry at 4522 feet. And in northeastern Oklahoma, Helmerich & Payne et al's Osage 1, NEc SE 13-23n-6e, northwest of the Gilliland pool, was a failure at 2825 feet. The well was started by Norbla Oil Company and was later taken over by Helmerich & Payne.

New type lease

Salem, Ore.—A lease form to be used by the Oregon state land board in leasing state lands for oil and gas prospecting under authority granted by the last legislature has been drawn up by Attorney-General I. H. Van Winkle. Terms of the lease provide the lessee will be under no obligation for payment of rent for the first six months if he does not elect to commence drilling operations within that time.

KANSAS FIELDS

Winget discovery offset produces after looking dry.

* * *

Test may prove Misener sand productive at Graber.

Wichita.—Features of activity in Kansas last week were production from a well thought to be dry; a possible pool opener in Cowley County, and a new producing horizon for the Graber pool of McPherson County.

Disappointing because it appeared to be a dry hole, Schoenfeld, Kitch and Hunter's Suppes 1, SWc 4-16s-16w, east offset to the discovery producer in the Winget pool of Rush County, reversed itself last week and came in as a producer. Top of the Oswald lime was found at 3249 feet, and after drilling ahead to 3446 feet the well made only about 15 barrels of oil daily following acid treatment. Reports at that time stated the well would be abandoned. The hole, however, was drilled to 3555 feet and filled 1200 feet with oil overnight from a formation later identified as conglomerate. The oil was found from 3543 to 3555 feet. When swabbed to the bottom, it filled at the rate of eight barrels of oil per hour. It was then drilled to 3559 feet, but found water. It is being plugged back for a production test.

New Cowley Pool Possible

Kansas operators are watching a possible pool opener east of Winfield in Cowley County. The well is Murta, Wilson et al's Turner 1, NEc NW 30-32s-6e. It swabbed 25 barrels of oil an hour from Peru sand at 2245 feet following a 90-quart shot. The sand was topped at 2220 feet and production came from 2232 feet. It is cleaning out for a production test.

The Misener sand may be the next producing horizon for the Graber pool of McPherson County, according to developments which took place at Derby Oil Company's Goering 8, SEc NE 17-21s-1w, at the north end of the field. When last reported the well had 600 feet of oil, coming from the sand at 3342 feet. The well made 65 barrels of oil on a swabbing test.

Olson Drilling Company and Vaccars Petroleum Corporation et al's Whelan 1, SWc NW 29-31s-11w, third test in the recently opened Whelan pool of Barber County, was completed for 864 barrels of oil at 4316 feet in chat. The well, the second largest in the pool, is an east offset to the same interest's Swartz 1, completed for 941 barrels of oil several months ago. The discovery well made a potential of 453 barrels of oil.

Wildcat Rebuliding Derrick

The most important strike in Ellis County in several months, Bridgeport Machine Company et al's Froelich 1, NW SW SE 4-13s-16w, north of Walker, was rebuilding derrick which buckled while pulling 10-inch casing. The well swabbed about 60 barrels of oil an hour from the Oswald lime at 3265 feet on preliminary tests.

Stanolind Oil & Gas Company's Struder 1, SEc SW 26-16s-13w, 3½ miles northeast of production in the Ainsworth pool of Barton County, drilled to 3412 feet and filled 1000 feet with oil in five hours.

The Texas Company's Kleile 7, SWc SE SW 34-19s-10w, on the east side of the Schartz sector in the Silica pool of Rice County, was completed for 2362 barrels of oil in 24 hours from the Siliceous lime at 3326 feet. What is hoped will be an extension well is Skelly Oil Company's Dittmers 5, NWc SW SW 28-19s-10w, in the northeast sector of the pool, which was a location.

The Texas Company's Brandenburg 1, in Section 20-14s-14w, east offset to the discovery producer in the Vaughn pool of Russell County, was completed for 624 barrels of oil from the Oswald lime at 3031 feet following acidization.

Continental Oil Company et al's Letsch 1, NEc SE 27-14s-13w, southeast of Russell in that county, filled 2600 feet with oil from the Oswald lime at 2848 feet but continued drilling. If production is not found in the lower formations, the well will be plugged back to the Oswald lime.

Magnolia Petroleum Company's Klassen 1, NW NE NW 21-19s-1w, at the north end of the Ritz-Canton area of McPherson County, was completed for 312 barrels of oil daily from the Wilcox sand at 3431 feet. It had previously pumped 624 barrels of oil during a 48-hour test.

Amerada Petroleum Corporation's Nelson 1, SW NW NE 5-32s-1w, at the southwest edge of the Wellington pool of Sumner County, was completed as a larger producer than other offset wells in the pool. It made 484 barrels of oil from the chat at 3692 feet following acid treatment.

Kansas wildcat drilling holding steady pace

Wichita.—The hustle and bustle of early summer wildcatting in Kansas remained on a fairly level plane last week as 10 wells were marked dry and abandoned on the drilling reports of various companies. Three wildcat tests in the state were completed for production, 2 for oil and 1 for gas. Offsetting the poor showings made was the starting of 13 more wildcats, mostly in central and eastern Kansas.

Best of the wildcat completions was C. L. Price et al's Kraft 1, SW NW NE 10-17s-11w, which opened a new pool for Barton County, west of the Breford pool. The other oil well was in Butler County, where Kahn and others completed Madden 1-A, SWc NE 27-23s-4e, for a potential of 30 barrels of oil and 60 barrels of water. M. B. Allen completed the gas well, Flack 1, NEc NW 1-26s-14e, southwest of the Yates Center oil and gas pool of Woodson County, eastern Kansas.

The abandoned wells were distributed. Davis & Sory lost Byrd 1, SWc SE 32-21s-11e, in Lyon County, the well being surrounded on three sides by production, most of it across the line in Greenwood County. It was abandoned at 1981 feet. North of the Eastman pool in Cowley County, Bess & Gralapp's Wakefield 1, NE SE SW 18-30s-6e, was abandoned at 3035 feet. A new well was reported for the county at Trees Oil Company's Hornbeck 1, NWc 5-33s-4e, southwest of Winfield and west of the McCollum gas pool. It was rigging up.

Ellis County lost two and gained one. Elwell & Trees Oil Company's Wickham 1, SWc NE 10-11s-19w, was struck off the drilling records at 3654 feet. It was several miles northeast of the Solomon pool. Second was J. C. Shaffer, Inc.'s Staab 1, SEc 25-12s-18w, southwest of the Shutts pool, which abandoned at 3841 feet. The new well was Earl Wakefield et al's Burnett 1, NWc NE 1-11s-18w, northwest of the Haller pool.

Three tests went off the list in Barton County. George Dickey et al's Boger 1, SEc NE 15-16s-13w, east of the Susank pool was abandoned at 3389 feet. E. F. Wakefield et al's Scheurermann 1, NEc SW 31-16s-15w, a rank wildcat southwest of Galatia, finished dry at 3580 feet, and Magnolia Petroleum Company's Zink 1, NWc SE 13-18s-11w, at the west edge of the county, was abandoned at 3326 feet.

Harvey County broke even, losing one test and gaining one. E. J. and E. B. Shawver completed Hege 1, NEc SE 26-22s-2w, at the north end of the Halstead pool, as a dry hole at 3027 feet. West of Hesston, Hollow & Bradley Brothers started Nevfledt 1, NE SE NW 17-22s-1w.

Shell Petroleum Corporation marked Haxton 1-B, NEc SW 29-18s-9w, dry at 2803 feet. It was northwest of the Ploog pool of Rice County. And in Reno County, Sinclair Prairie Oil Company's Nett 1, NWc SE 32-26s-4w, south of the Hilger pool, was dry.

The spirit of "nothing venture; nothing gain," keeps Kansas in the upper bracket as one of the most active in the Mid-Continent. Starts in the area, other than those already mentioned, were found from Range 14 east to 19 west. Atlantic Refining Company was rigging up rotary for Kachelman 1, SE NW

NW 13-25s-14w, in Stafford County; Atlantic, Empire and Skelly were doing likewise at Runyon 1, SW NW NE 11-27s-13w, in Pratt County. Two tests were under way in Butler County which has been enjoying a flurry of drilling during the past few weeks. They were Colonial Oil Company's J. W. Blunk Estate 1, NEc 13-34s-14w, which was moving in materials, and W. I. Southern, Inc.'s Davis 3, SEc NE 24-34s-15w, a rotary rig.

In Sedgwick County, Union Oil & Refining Company et al's Howell 1, SWc 6-29s-1e, was in the cellar; W. M. McKnab was building rotary rig for Blair 1, SWc 7-30s-1e, in Sumner County, and G. T. Berry's Zimmerman 1, SW NE SE 15-30s-10e, southwest of Howard, was drilling at 49 feet. Two starts were made in the eastern part of the state, in Chautauqua County. They were Buffington & Cohen's Hayes 1-A, SE NE SE 10-33s-13e, west of the Longton gas field, and C. L. Brosius et al's Garrett 1, NW SW NW 26-32s-11e, west of the Berlin gas pool.

Two more wells wound up the list of starts. In Rush County, Carter Oil Company et al's Prosch 1, CEL N½ SE 21-18s-16w, was drilling at 385 feet, southwest of the Otis gas and oil pool, and in Rooks County. W. W. Kiskadden was moving in materials for Ham 1, SWc NW 25-7s-19w, east of Webster.

KANSAS

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
BARTON COUNTY—		
Republic Natural Gas, McLean 6, nw ne se 25-17s-11w	1564	3292
Sinclair Prairie, Davidson "A" 1, nw ne nw 9-16s-11w	*	3358
BARTON COUNTY—		
Spencer and Yarnell, Patzner 3-k, nw ne se 36-17s-11w (otd 3071)	6488	3071
Dickey et al, Boger 1, se se ne 15-16s-13w	*	3389
Magnolia, Zink 1, nw nw se 13-18s-11w	*	3326
Wakefield et al, Schuermann 1, ne ne sw 31-16s-15w	*	3580
Stanolind, Kowalsky 1, nw nw ne 11-20s-11w	2260	3282
Magnolia, Reetnel 6, nw nw se 24-20s-11w	1470	3242
BUTLER COUNTY—		
Kahn, Madden 1, sw sw ne 27-23s-4e	30	2225
CHASE COUNTY—		
Propp-Fromm & Austin, Fromm 1, se se se 29-18s-9e	*	2803
COWLEY COUNTY—		
Bess Grallopp, Wakefield 1, ne ne sw 18-30s-6e	*	3035
McNabb, Moon 1, cse 21-32s-5e	¶¼	695
Sinclair Prairie, Collinson 2, ne nw se 5-34s-3e (pb 3323)	8	3358
Shawver, Mulkay 1, sw ne se 5-34s-3e	157	3320
ELLIS COUNTY—		
Gulf Oil Corp., Cress 1, se se se 12-113-17w	2168	3295
Margay Oil, Bemis "C" 3, nw se sw 22-11s-17w	2706	3473
Deep Rock, Baumer 3, sw nw ne 27-11s-17w	2943	3419
Elwell and Tree Oil, Wickham 1, sw sw ne 10-11s-19w	*	3653
Lario, Walter "B" 2, se se sw 2-12s-18w	1965	3605
Carter Oil, Staab 2, ce¼ e½ nw 11-12s-18w	1693	3629
Phillips, Staab 1, nw nw ne 11-12s-18w	2200	3631
J. C. Schaffer, Inc., Staab 1, se se se 25-12s-18w	*	3841
Bridgeport, Madden Est. 2, cnw nw 26-15-18w (pb 3563)	430	3565
ELLSWORTH—		
Spencer and Yarnell, Patzner "B" 1, nw nw sw 31-17s-10w	2441	3248
ELK COUNTY—		
Diller O&G Co., A. Key 2, csw nw 25-31s-10e	50	2265
GREENWOOD COUNTY—		
Gore-Beren et al, Inthurm 22, csw se 4-23s-13e	65	1776
Mid-Continent, Dehlinger 10, sw sw ne 28-23s-13e	13	1775
HARVEY COUNTY—		
Shafer & Shawver, Hege 1, ne ne se 26-22s-2w	*	3027
LYON COUNTY—		
Murphy 1, se nw ne 32-21s-11e	*	1981
McPHERSON COUNTY—		
Magnolia, Klassen 1, nw ne nw 21-19s-1w	312	3431
Stanolind et al, Lobett 1, cnw sw 13-19s-2w (otd 2952)	261	2961
Continental, Kindblade 2, se ne sw 20-21s-1w	251	3332
MORTON COUNTY—		
Kuhn Bros., Walker 1, cne 33-34s-39w	¶9	2774
RENO COUNTY—		
Wilcox O&G, Manford 2, ne nw sw 12-23s-4w	789	3415
Barnsdall, Westfall "A" 6, cs½ s½ se 19-24s-4w	1021	3384
Carter, Hogan 3, ne ne sw 19-24s-4w	388	3395
National Pet. Corp., Tucker 3, sw se ne 19-24s-4w	1752	3391
I. T. I. O., Mueller 2, cn½ n½ ne 30-24s-4w	548	3376
Ohio Oil, Mueller 2, nw sw nw 30-24s-4w	480	3400
Sinclair Prairie, Nett 1, nw nw se 32-26s-4w	*	4184
RICE COUNTY—		
Continental et al, Fueller 1, se se nw 12-18s-8w	*	3254
Gulf, S. Wendell 8, se sw se 32-19s-10w	1750	3307
Republic Nat. Gas, Wendell "A" 6, ne se ne 32-19s-10w	1968	3273
Barnsdall, Hathaway 1, sw nw ne 33-19s-10w	2155	3284
Tatlock, Poncin 3, ne nw ne 5-20s-10w	1782	3307
Poncin 4, se nw ne 5-20s-10w	1406	3314
Gulf, Schmidt 2, nw se se 6-20s-10w	936	3322
Stanolind, Specht 16, se nw se 6-20s-10w	2146	3310
Atlantic, Patton "C" 2, se sw sw 5-21s-7w	682	3334
Lauck, Baker 1, ne ne sw 7-21s-7w	*	3383
Atlantic, Mills 2, nw ne nw 8-21s-7w	713	3341
Douglass & Derby, Hauschild 4, nw nw nw 15-21s-7w	1492	3386
RUSSELL COUNTY—		
Empire, Ehrlick 9, sw se se 28-13s-14w	893	3286
Stearns & Streeter, L. Miller 4, ne se nw 31-14s-13w	1151	2936
Texas Co., D. Brandenburg 1, nw nw nw 20-14s-14w	624	3031
Transwestern Oil, H. Polcyn 7, se se se 10-14s-15w	691	3261
W. Polcyn 4, nw sw sw 11-14s-15w	698	3239
W. Polcyn 5, sw sw sw 11-14s-15w	785	3219
W. I. Southern, Inc., Michaelis 7, nw nw nw 31-15s-13w	2728	3283
Gulf, Michaelis 4, sw nw sw 32--15s-13w	1580	3353
SEDGWICK COUNTY—		
Derby, Eastborough 7, ne sw ne 19-27s-2e (otd 3270)	*	3595
STAFFORD COUNTY—		
Stanolind, Heyen "B" 8, se se ne 31-22s-11w	2017	3560
Lario & Atlantic, Morgan 4, ne ne se 23-24s-13w	*	4111
Stanolind-Amerada, Elwell 2, cs½ s½ ne 23-24s-13w	1082	4074
STEVENS COUNTY—		
Missouri Valley, Gustafson 1, csw 29-32s-28w	¶11	2715
Southwestern, Spikes 1, csw 4-34s-37w	¶4¾	2841
SUMNER COUNTY—		
Amerada & Sunray, Gassoway 13, csl se sw 14-32s-2e (otd 2882)	*	3530
Continental, Rothrock 4, sw nw nw 4-32s-1w	1024	3675
Amerada, Nelson 1, ne ne nw 5-32s-1w	484	3692
Transwestern Oil, McKee 1, nw nw se 5-32s-1w	2	3730
WOODSON COUNTY—		
Pure Oil, Peek 9, ce½ ne ne 20-23s-14e	20	1641
Alexander et al, Funk 1, se sw ne 22-23s-14e	119	1636
McGinnis, Bowles 1, sw se nw 31-23s-14e (pb 1603)	10	1610
Allen, Flack 1, ne ne nw 1-26s-14e (pb 1337)	¶2	1342

*Failures; †Junked; ¶Million cu. ft. gas.

CONNALLY ACT

Passes House with two-year limitation clause

Washington.—Ruling out as irrelevant proposed amendments to divorce production and refining from marketing and to repeal the oil tariffs, the House of Representatives on June 3, by a vote of 189 to 93, passed the Connally-Dies bill, extending the Connally contraband oil act until June 30, 1939, and sent the legislation to conference.

As passed by the Senate, the measure made the act permanent, but it is not believed any difficulty will be encountered in securing approval of the two-year extension, which is designed to make the law terminate coincidentally with the Texas conservation act.

The House spent several hours in consideration of the measure, with a small group, in which Representative Biermann of Iowa was prominent, pleading the cause of the independent marketers in opposition to the bill. In a vain effort to upset the "monopoly situation" which the marketers charge has been made possible by the Connally act, the Interstate Compact, the Bureau of Mines forecasts and the import taxes, Biermann sought consideration of two amendments, the first of which would prohibit any producer-refiner to engage in marketing and the second the repeal of all tariffs on crude oil and its products.

On objection by Representative Cole of Maryland, chairman of the subcommittee in charge of the bill, the amendments were ruled not germane.

Because of the pendency of the Administration measure controlling hours and wages in all industries, Representative Boren of Oklahoma announced he would not press the amendment he suggested during the hearings, calling for a six-hour maximum working day and a $5 minimum wage, believing that the proposed general legislation will protect the workers in the oil industry.

STRIPPER WELL MEET

Tulsa.—The annual meeting of the National Stripper Well Association has been called by President William Bell of Robinson, Illinois, to meet at Tulsa, Oklahoma, June 17, 1937.

At the morning session the reports of the officers will be present and the committees for the meeting will be appointed. At noon Bell will entertain the delegates at a luncheon, following which there will be a general discussion and informal exchange of views with reference to problems pertaining to stripper wells, and then the reports of the committees will be considered and officers for the ensuing year will be elected.

Los Angeles.—Pacific Gas & Electric Company has asked the California Railroad Commission for permission to build 58 miles of pipe lines at a cost of about $900,000 to serve the new Rio Vista gas field where Amerada Petroleum Corporation has an average output of 10,000,000 cubic feet of gas, choked back, from eight wells. Standard Oil Company of California has one gas well in this Solano County field.

NORTH AND WEST TEXAS

Gaines County wildcat has promising indications.

* * *

Ward County shallow oil extension in prospect.

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Clay County producer shut in pending pipe line.

Midland.—Appearance of high pressure gas production at intervals in the upper section of the lime topped at 3830 feet by Amon G. Carter and Continental Oil Company's A. L. Wasson 1, SW SW NW Section 48, Block A-XT, northwestern Gaines County wildcat, enhances production possibilities for the area. Sulphur gas began breaking through rotary fluid at 4648 feet, with increases noted while drilling to the 4800-foot level. The test has an elevation of 3549 feet.

Operations have been launched on three additional tests, extending 2½ miles to the northeast, by the above operators in order to protect short term leases.

The partnership's G. M. Langdon 1, SE SE NW Section 44, Block A-X, was drilling at 1884 feet, and Wasson 1-B, NWc Section 47, has spudded with a machine. Continental Oil Company's W. McCarty Moore 1, SWc Section 46, and south offset to the latter, also spudded with machine.

Pipe Line May Enter

Development of commercial production by the original test on the geophysical prospect will likely speed up the entry of a major pipe line company into the north portion of the Permian basin with a line. Nearest facilities are those of Humble Pipe Line Company in the Means field, Andrews County, and several majors to the southwest at Hobbs, New Mexico.

Other interests have acquired lease protection in the Wasson area on a basis that calls for early development. Humble Oil & Refining Company is one of the late entrants, having purchased a lease from Coline Oil Company on the W½ and NE Section 309 and W½ Section 345, Block G, for $100 per acre, payable from production, and Coline Oil Company (Santa Fe Railroad) is carried for 1/24 over-riding royalty.

York and Harper, Incorporated, have a drilling obligation on the E½ Section 345.

Hole cavings have developed in Shell Petroleum Corporation's Mann 1, east offset to the discovery well of the Seminole area, Gaines County, and the production was killed early last week to condition the hole. Last gauge credited the well with making 44 barrels of fluid, 6 percent rotary returns, in 16 hours through one-inch choke, with 750 pounds casing pressure. It is producing from lime at 5027-60 feet with an elevation of 3348 feet.

Harry Adams et al's discovery well is shut in.

Amerada Petroleum Corporation's Fasken 1, C NW NW Section 160, Block G, about 4½ miles southeast of the above production, logged top of Yates sand at 3232 feet, with an elevation of 3283 feet, and showed sulphur gas at 3305-11 feet. A string of nine-inch has been cemented at 3342 feet for protection.

Wildcat Hits Sulphur Water

The eastern Cochran County wildcat of R. S. Bond, L. C. Harrison and E. E. Fogelson on the Cameron ranch, Labor 1, League 85, Greet County school lands, encountered first sulphur water at 4800 feet, or 1100 feet sub-sea, with an increase at 4875-80 feet. It will continue to its contracted depth.

Ernest L. Wilson, Illinois Oil Company et al's Yellowhouse 1, southeastern Bailey County prospect, has cemented seven-inch pipe in lime at 4497 feet, and will change to standard tools. First lime stringer was called at 3520 feet, or 167 feet above sea level.

In Yoakum County, Bahan, Rhodes and Jean Fitzpatrick's Shook 1, C NE Section 420, Block D, was drilled in lime at 4720 feet, with an elevation of 3761 feet, and its structural position is about normal for the area.

Magnolia Petroleum Company's Taylor 1, NEc Section 201, Block D, is waiting for standard tools at 4024 feet after cementing nine-inch pipe.

Ordovician Search in Ector County

Search for Ordovician lime production in the Permian basin is scheduled to extend into southwestern Ector County. P. N. Wiggins, Jr., and H. H. Lawson have purchased a lease on a block of 6000 acres, and propose to drill a 7000-foot test on the Leon Goodman land, C SE Section 5, Block B-14, PSL Survey. Wilcox Oil & Gas Company recently assumed a contract to drill an Ordovician test on the McKnight ranch in northwestern Crane County. Gulf Oil Corporation's McKnight 2, C NE Section 9, Block B-21, which missed the McKnight shallow oil zone, was drilling at 5284 feet, and will try for the Ordovician. The latter concern's W. N. Waddell et al 5, offset to its prolific deep producer in the Sand Hills field, Crane County, was drilling at 2510 feet.

Moore Brothers Corporation sold protection acreage to majors for financing an 8000-foot Ordovician test on Block 2, I&GN Ry Survey, west central Crockett County. Superior Oil Company et al's Massie Unit 1, near C SE NE Section 55, Block UV, G.C.&S.F. Ry. Survey, Crockett County, was drilling shale near the 5900-foot level, with the Ordovician as its objective.

Extensions Likely

Important extensions for the shallow oil zone in southern Ward County looked promising the past week. Oil States Exploration Company's M. L. Johnson 1, located on a 70-acre lease, Section 9, Block 32, H.&T.C. Survey, filled 700 feet with oil and flowed by heads from pay at 2014-30 feet, with the hole bottomed at 2050 feet. The location is about two miles southwest of Grand Falls. L. B. Hoss and Frank Downey et al's Mrs. A. Blair 1, located on 240-acre lease, about 1½ miles south of the town and on a strike with the Pecos Valley field, showed 1500 feet oil from sand at 2118-27 feet, with an elevation of 2433 feet. Both are isolated from production by failures.

Extension shifts interest in East Bryson field

Wichita Falls, Texas. — Lease and royalty trading in the East Bryson field, Jack County's most productive Strawn sandy-lime area, shifted to the northeast following an important extension. Barney Cockburn et al's R. R. Clayton 1 advanced the productive limits of the field about 4000 feet with a 405-barrel natural flow from broken pay at 2938-82 feet and 3015-55 feet. H. M. Leidecker et al's Padgett 1, located 2800 feet east of the northeast edge of the original Bryson field, centering 3 miles northwest of Bryson, showed for a commercial producer in Strawn at 3197-3202 feet. It was deepened to the salt water level, and will be plugged back.

Completion gauge for Walter H. Gant et al's C. M. Worsham 3, reported last week as proving a new oil horizon for the Worsham ranch abandoned oil pool, Clay County, has been delayed pending laying a line by Magnolia Pipe Line Company. This well flowed 55 barrels of 45.8 gravity oil in 30 minutes on 1-inch choke on Railroad Commission gauge after being shut in several days. It is producing from lime at 3920-27 feet, and is a short distance from old wells depleted in the 3400-foot sandy-lime horizon. Gant et al entered the area last year, and drilled failures at 5137 feet and 3906 feet, but the logs of the latter indicated the lower lime offers oil possibilities.

Plugging orders were issued late last week. The Texas Company's A. D. Moore 1, near C NE Lot 1, Section 3412, 1 mile east of the Knox field, Young County, and ½-mile south of the above company's W. C. Burns 1, near NW Section 1986, which is flowing 40 barrels daily from 4100-foot lime after being on production since 1932.

WEST CENTRAL TEXAS Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
BROWN COUNTY—		
R. M. Coleman et al, Laughlin 1....	*	1260
J. L. McMurray et al, Eddington 1..	25	1333
CALLAHAN COUNTY—		
Beams Prod. & Dev. Co., Jackson 16-D	*	1316
Chas. Hobbs et al, Hughes 1.....	*	810
Earl Johnson et al, Little 1.....	*	405
EASTLAND COUNTY—		
C. R. Cox et al, O'Rear 1.....	5	2850
Hoffman-Page Co., Merrell 1.....	¶2.8	3440
W. R. Seed et al, Wright 1.....	5	1439
States Oil Corp., Parrock 8.....	10	1860
L. L. Welborn et al, Fox 2.....	*	1419
McCULLOCH COUNTY—		
Geo. Poulter et al, C. C. Dawson 1.	*	700
John W. Westbrook et al, G. S. Johnson 1	*	1200
PALO PINTO COUNTY—		
D. H. & C. Dev. Co., Davenport 1..	*	2000
A. S. Hickock et al, Robinson 4....	20	1530
SHACKELFORD COUNTY—		
Baker Oils, Inc., Davis-Walker 1....	118	1566
Baker-Pardue & Evans, Davis 1.....	*	1634
Bell O&G Co., L. G. Davis 2.....	*	1841
Boller & Rutledge, Davis 1.....	40	1729
W. E. Butler & Horn, Davis 1.....	35	1632
Charter O&G Co.-Jones & Stasney, G. R. Davis 1	117	1623
Dean Bros. et al, Newell 1-C.....	*	1402
Gilcrease Oil Co., Newell 1.....	*	1560
Groover-Rose et al, Nail 1.....	*	1604
J. H. Healey et al, Clarke 9.....	11	673
Newell 1	*	1760
A. Housley et al, Reynolds 7.....	25	904
A. A. Hutton et al, Alexander 1.....	*	800
H. T. G. Oil Co., Green 1.....	*	1040
Iron Mountain Oil Co., Baker 1....	*	2035
Owens-Snebold Oil Corp., Ivy 2....	340	1941
Roeser-Pendleton, Inc., Dawson 26, sec 202	127	1619
Dawson 27	24	1611
Dawson 28	*	1613
Dawson 29	81	1615
Tannehill Oil Co., Newell 41.....	65	940
Ungren-Frazier, Jackson 1-J.....	*	1247
Ungren-Frazier et al, Snyder 1.....	*	4427
West Texas Oil & Prod. Co., Morris-Buie 11	115	1598
TARRANT COUNTY—		
Johnson & Mannon, Roy Cannon 1..	*	869

WEST TEXAS

Company, Well and Location	Init. Prod. Bbls.	Depth
ANDREWS COUNTY (Means)—		
Humble, J. S. Means 22.....1099		4528
Sun Oil Co., J. S. Means 1-C..... 184		4537
ECTOR COUNTY (Foster)—		
Empire O&R Co., J. E. Bagley 1.. 475		4251
ECTOR COUNTY (Goldsmith)—		
Atlantic Ref. Co., H. E. Cummins 2-B	220	4255
Devonian Oil Co., C. Scharbauer 3-A	198	4236
Gulf Oil Corp., Goldsmith 21.....	988	4214
Landreth Oil Corp., C. Scharbauer 5-C	982	4229
John E. Mabee & Blackstock, H. E. Cummins 1	761	4250
Ben F. Nysenwander-W. H. Dunning Est., C. Scharbauer 2.....1442		4228
Shell, H. E. Cummins 1-A 605		4251
ECTOR COUNTY (Judkins)—		
J. P. Cusack et al, University 1.... 235		3740
ECTOR COUNTY (North Cowden)—		
Sinclair Prairie, T. A. Smith 4.... 295		4265
GLASSCOCK COUNTY—		
Conoco & Group 1 Oil Corp., Settles 32-S	424	1270
HOWARD COUNTY—		
Illinois Oil Co., J. P. Davis 6-B.... 689		2856
Owen M. Murray et al, Logan 2 .. 518		2872
Standard Oil Co. (Tex.) Dodge 7.. 205		2844
JONES COUNTY—		
Fain-McGaha Oil Corp., N. Hayden 1-B	*	2505
R. B. Farris et al, Guitar 1..... 300		1975
Farris-L. Fikes & Ungren-Frazier, Guitar 8	600	2012
Guitar 9	654	2010
Guitar Trust Est., Fee 1 950		2004
Thos. D. Humphrey, H. Dorsey 19. 378		2218
H. Dorsey 20 119		2217
Guitar Trust 2 611		2005
A. P. Kouri et al, J. D. Winkles 1	*	2105
Lewis Prod. Co., H. Sayles 3..... 288		1908
John L. Reeves et al, S. A. Kelly 1 15		2251
Sandy Ridge Oil Corp., McCreight 2 60		1947
Sinclair Prairie, B. King 6-B..... 59		2230
E. A. Ungren & A. J. Frazier, Dorsey 9	375	2218
Dorsey 3-A 119		2155
Dorsey 5-D 735		2224
PECOS COUNTY (Pecos Valley)—		
E. M. Thompson Prod. Co., Pecos Valley Oil Co. 2 202		1619
PECOS COUNTY (Wildcat)—		
Fred Read et al, L. L. Byrne 1.... 10		1371
TAYLOR COUNTY—		
Bert Fields, D. J. Finley & A. W. Cherry, S. D. Hines 1.....	*	2565
Hal Hughes et al, W. H. Manahan 1	3	2100
S. B. Roberts & Brown Eagle Oil Co., J. W. Harris 1.....	*	2110
TOM GREEN COUNTY—		
Spinner Oil Co., Reed Bros. 1.....	*	3320
UPTON COUNTY (Gulf-McElroy)—		
Gulf Oil Corp., McElroy 150.....4422		2844
UPTON COUNTY (McCamey)—		
Arnold Oil Co., L. H. Harrell 3.... 266		2165
British-American O.P. Co., Robbins 7 894		2284
Clark & Cooper, J. B. Perry 1..... 90		2216
Magnolia, E. S. Hughes 7..... 498		2281
G. J. Smith et al, A. S. Burleson 1.. 340		2185
Snowden-McSweeney Co., Hughes 4. 91		2450
WARD COUNTY—		
Amerada Pet. Corp., McDonald 3... 934		2460
Empire O&R Co., W. W. McDonald 2 309		2431
Gulf Oil Corp., E. W. Estes 23..... 949		2650
E. W. Estes 24 1391		2940
E. W. Estes 26 530		2650
E. W. Estes 28 1723		2685
Hutchings 65 297		3085
Hutchings 77 1369		2758
Sinclair Prairie, F. Cornagie 1-B.. 22		2325
Turman Oil Co., Archenhold-California 5 22		3055
WINKLER COUNTY (Henderson)—		
Gen'l Crude Oil Co., J. W. Hess 2.3000		3074
Humble, J. B. Walton 13-C.....7500		3050
W. K. Royalty Co., Walton-Humble 4-A 10,000		3060
WINKLER COUNTY (Kermit)—		
Harry Adams, Hitchcock et al, Walton 2-A 2754		3088
Bert Fields et al, O. Clapp-Pure 6.1958		3104
O. Clapp-Pure 9 1947		3116
Gulf Oil Corp., Daugherty 40..... 718		3145
Daugherty 42 599		3020
Humble, N. R. Colby 17-A.....1417		3112
N. R. Colby 12-C.....1076		3086
Magnolia, N. R. Colby 10..... 336		3141
J. B. Walton 80..... 592		2940
TP Coal & Oil Co., Daugherty 20.. 499		2945
TP & E. M. Wahlenmaier, R. Clapp 3	897	3104
Tide Water Associated, Walton 16.. 996		3130
WINKLER COUNTY (Keystone)—		
Gulf Oil Corp., Keystone 17..... 208		3550

*Failures; †Junked; ¶Million cu. ft. gas.

TEXAS PANHANDLE Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
CARSON COUNTY—		
Empire O&R Co., Magnolia Pet. Co. 10-D, ... 550		3012
Skelly, H. Schafer 84 985		3085
GRAY COUNTY—		
Doniphan O & G Co., T. B. Cobb 3 357		3372
Gulf, S. Faulkner 7-A 252		2956
HUTCHINSON COUNTY—		
Drilling & Exploration Co., Inc., W. B. Haile 11 327		3074
J. M. Huber Pet. Co., W. E. Herring-Magnolia 1 .....¶44.8		2792
Phillips, H. R. Staples 2..... 452		3202
MOORE COUNTY—		
Phillips, H. B. Pythian 1 .....¶45.1		3275
Shamrock O & G Corp., J. T. Sneed 4, Sec. 39 .....¶10.6		3195
WHEELER COUNTY—		
El Bar Corp., J. M. Noel 11 59		2470

*Failures; †Junked; ¶Million cu. ft. gas.

Ask Small to explain meaning of his gas law

Austin.—Hearing to work out the enforcement of Senate Bill 407, the sour-gas law passed by the legislature's regular session, has been dated by the Railroad Commission for June 18. The hearing will follow the state-wide oil and gas proration hearing.

Chief object of the meeting will be to determinte the extent of the law and just what its author contemplated; hence one of the principal witnesses is expected to be Senator Clint Small of Amarillo, who wrote the law.

Possibly most important result of the law is the requirement that gasoline stripping plants be licensed by the railroad commission. Regulation of these plants in the past has been on a somewhat haphazard basis. Only plants operating in reservoirs producing both sweet and sour gas are included, which, for all practical purposes, limits application to the Panhandle.

The law says that any such plant "in which casinghead is commingled with sweet or sour gas" must obtain a permit; and a qualification for the permit is that the residue must be disposed of "in accordance with the provisions of this section."

Those provisions are: " . . . It shall not be lawful to blow into the air any of the residue . . .; provided, an amount may be blown into the air as is determined by the commission to be necessary in order to accomplish uninterrupted deliveries to carbon-black plants . . . "

That provision is entirely ambiguous and is one upon which engineers want clarification. More to the point is the next provision: ". . . it shall be the duty of the commission to ascertain the quantity of residue needed for fuel purposes (for plant and lease). The operator of such plant shall be required to utilize for one of the uses provided for sweet gas by existing law, a quantity of residue equal to the amount of sweet gas taken into the plant for processing . . . "

In other words, for every foot of sweet gas taken into an extracting plant, a foot of residue must be utilized for heat or lighting purposes; and in determining the quantity, the commission may allow only the amount actually used by the plant in fuel operations.

This is said to be aimed at what was liberally called "carelessness" in some stripping plants which mingle sweet and casinghead gas in their operations, claiming that the residue gas used for

University of Texas

OIL AND GAS LEASES

In Crane, Ector, Andrews, Upton, Crockett and Pecos counties offered at public auction June 25, 1937, at the Highway Building Hearing Room, Austin, Texas.

For additional information, write to the Secretary, Board for Lease of University Lands, University Station, Austin, Texas.

fuel is equal to the sweet gas. Hereafter, claims must be substantiated by proof.

The law also provides for the proration of production of sour gas wells, in strict conformity with the demand. The basis of proration is not set up by the law, except that it shall be to prevent "cognizable and preventable drainage."

NORTH TEXAS

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
ARCHER COUNTY—		
Mrs. Thelma Andrews et al, N. I. Andrew's 1-A blk 22	†	1054
J. D. Carpenter et al, Fee 1-B, sec 38	*	1153
Empire O&R Co., L. F. Wilson 19-C, sec 29	*	1802
Golding & Cochran, J. M. Kunkle 2, blk 8	12	1167
J. T. Miller et al, R. L. Kempner 1, blk 67	*	2004
S. & H. Drl. Co., C. A. Mangold 1, blk 21	10	658
Shappell Oil Co., John Conner 2	*	1133
Jack Storey et al, W. J. McMurtry 2, blk 11	*	803
BAYLOR COUNTY—		
Consolidated Oil Co., Portwood 1-EE, sec 1279	35	1427
CLAY COUNTY—		
Bridwell Oil Co., Saner-Lomax 11	12	217
Metzner & Burns, Thornberry 20, blk 11	*	350
Metzner & Gerard, Thornberry 7, blk 6	*	360
Regal Oil Co., W. F. George 4, blk 4	*	1179
COOKE COUNTY—		
Bridwell Oil Co., R. W. Trew 3-B	*	1728
Kerlyn Oil Co., C. B. Blagg 3	50	2061
F. C. Owen 1	*	1945
F. W. Merrick, Inc., Knabe 38, blk 6	12	827
Mudge Oil Co., J. R. Johnson 20	*	1237
Vindicator Oil Co., J. Walterscheid 14	4	810
FANNIN COUNTY—		
O. J. Oil Co. (Joiner-Owens), J. R. Goss 1	*	2737
JACK COUNTY—		
Brazos River Gas Co., J. A. Jones 5, sec 7	40	2382
H. C. Moore 3	35	2990
Corvette Oil Corp., Clayton Bros. 5	1	3110
Deep Oil Dev. Co., Bryson 2	254	3040
Hamilton Pet. Co., A. B. Kuykendall 6	¶3.6	3250
Hammon & Herbert, F. H. Rhodes 5	125	2335
Thos. D. Humphrey, M. B. Cook 2-A	119	2963
Kimberlin & Howse, Bryson Townsite 4-A	*	3170
John Korp et al, D. M. Rumph 6	10	533
Harry S. Moss et al, J. M. Bloodworth 1	*	3575
Mullendore, Berry & Berry, D. C. Clayton 2	134	3046
Trentman Oil Corp., Miller-Chambers 1	*	3200
MONTAGUE COUNTY—		
Selby O&G Co.-Lee R. Payne, J. W. Batts 1	*	5539
The Texas Co., Cunningham 17-A	47	926
WICHITA COUNTY—		
Coleman & Coppock, G. R. Hodge 9-A, blk 39	8	855
Peckham Oil Co., W. T. Waggoner Est. 4, sec 13	*	1988
Perkins-Cullum Oil Co., S. B. Burnett 29, sec 5	*	1597
Pet. Producers Co., J. A. Fisher 1, sec 15	*	1992
Pois & Schultz, Foster-Allen 6-C, sec 2	*	2002
Geo. Proctor et al, Foster-Allen 9-A	150	1545
YOUNG COUNTY—		
Samuel S. Alexander, G. B. Hamilton 9, sec 3401	15	915
Alexander & Nunnley, H. O. Prideaux 2	10	578
Cable Oil Co., Mrs. S. E. Snider 35	7	588
B. C. Gilmore et al, J. W. Cox 1-A, blk 18	*	611
E. L. Hanson et al, J. O. Stratton 2	10	512
J. O. Stratton 3	5	522
C. A. Lupton-Jerome McLester, G. M. Gibson 2	368	3700
Rathke Oil Co., W. H. Wadley 4	669	3617
E. C. Reed et al, Geo. Brooks 2, sec 1919	*	575
Stuckey O&G Co., J. W. Jones 1	5	515

*Failures; †Junked; ¶Million cu. ft. gas.

Talco edge failure is prospective deep test.

* * *

Long Lake Trinity test quits after trying deep.

* * *

Northeast Rusk County to get test to Trinity.

Talco, Texas.—Exploration of the lower section of the Paluxy series and possibly a deep test is underway on Magnolia Petroleum Company's J. A. Chapman 2, offset to the eastern-most producer in the Talco field, after failing to make a pumper from regular zone at 4215-67 feet. The company-manned rotary was drilling in Red Beds at 4547 feet, with an elevation of 329 feet, according to late reports. Chapman 2 is 660 feet southwest of the company's east outpost, which pumped 48 barrels of 19.6 degrees gravity pipe line oil from 5 feet of sand in the regular pay and lower pay at 4350-67 feet. Production possibilities from the Glen Rose, or lower Trinity, on the east portion of the Talco faulted structure are considered remote since J. Z. Werby et al's Sam Williams 1, NWc MEP&P Ry. Survey, 2¼ miles east of production, was abandoned as a failure last March at 6219 feet.

Completion gauge given F. D. Jones et al's Bassham-Gulf 1, located 1700 feet northeast of nearest production in the Sulphur Bluff field, Hopkins County, averaged 20 barrels per hour through open tubing at 4541 feet, or 4106 feet sub-sea. Top of Paluxy series was logged at 4456 feet, and first oil saturation at 4482 feet. The well recorded a closed in pressure of 100 pounds, or less than the average for the field. Log reveals that the fault was cut at 3111 feet. Jones et al have skidded rotary to drill a second test 500 feet to the north. The Texas Company's Davis 1-A, 4 locations west of nearest production, logged top of broken pay at 4498 feet, with saturation at 4525-37 feet, and shale at 4547 feet. Seven-inch pipe has been cemented for a production test. Shell Petroleum Corporation has been granted permits to drill 3 additional tests on the north line of its adjoining lease.

Stanolind Oil & Gas Company's Hawks 1, located on the Campbell structure, Hunt County, was coring lower Glen Rose formation at 5910 feet, with an elevation of 566 feet. It is generally conceded to be eliminated as a prospective producer. Base of anhydrite was logged at 5560 feet.

General Crude Oil Company et al are rigging up for a Trinity test in the northeast corner of Rusk County, with portion of the block extending into Gregg and Harrison Counties. Location is on the F. H. and J. K. Bivens 500-acre tract, Russell Williamson Survey, between the Santa Fe Railroad and the Sabine River. B. F. Miller et al made an unsuccessful attempt to finance a Trinity test several years ago on a block 2 miles to the northwest, and in Harrison County.

Plugging orders have been issued for Mrs. S. O. Thompson and H. H. Jaffe's Rosemond 1, about 3 miles southwest of Red Water, Bowie County, after deepening to 6015 feet. Top of Hill zone, producing horizon in Rodessa field, was logged at 5759 feet, with an elevation of 285 feet.

Deepest Woodbine test quits as a dry hole

Palestine, Texas.—Two wildcat failures in the Woodbine and the elimination of a lower Trinity prospect were recorded the past week in the south portion of the East Texas basin area. Tide Water Associated Oil Company and Seaboard Oil Corporation's Monnig Bros. 7, first Trinity test for the Long Lake field, Anderson County, was listed as a dry hole after plugging back from 9971 feet and failing to make a producer from the Woodbine and Sub-Clarksville zones. It establishes a depth record for the Woodbine basin. Owners passed up an opportunity for a listing among the comparatively few 10,000-foot drilled holes, with only 29 feet of the mark, after an electrical formation surveying instrument credited the Travis Peak zone, topped at 9930 feet, with an elevation of 233 feet, as being barren of oil or gas.

Barnsdall Oil Company's H. C. Swanson 1, NWc 243-acre lease, Richard Duty Survey, northeast edge of Jarvis, Anderson County, showed salt water in several drill-stem tests after entering Woodbine sand at 4406 feet, or 4076 feet sub-sea, and was drilling at 4750 feet to fulfill contract. Stoco Oil Company and Joe M. Burnham's E. B. Parks 1, SEc 17 3/3-acre lease, J. T. Cook survey, 4 miles southwest of Rusk, Cherokee County, encountered water in Woodbine zone at 5060-

5213 feet, with an elevation of 417 feet, and will be plugged.

American Liberty Oil Company et al's W. L. Moody 1, NEc of 395.8-acre tract, S. C. Parker Survey, about 1½ miles northwest of two gas-distillate wells on the Grapeland structure, Houston County, logged Pecan chalk at 4551-4842 feet, and was drilling at 5010 feet.

Operations were resumed late last week on Pure Oil Company's Kendrick 16, Trinity test for the Mexia field, after cementing pipe in Georgetown lime. Roeser-Pendleton, Inc.'s Bowyer 3, west flank test for the Cayuga field, Anderson County, logged first anhydrite stringer at 7110 feet, with an elevation of 317 feet, and was drilling at 7500 feet. The flank position occupied by this test is considered favorable for determining if the lower Glen Rose series will yield oil production. Two commercial gas-distillate wells have been completed in the latter horizon near the top of the structure.

Humble Oil & Refining Company's Rigg 1-A, northeast edge Van field, was drilling in lime near the 3900-foot level.

Rodessa Salt Water

Shreveport.—A total of 118 wells in the Rodessa field are showing salt water, according to the latest compilation of salt water encroachment there. Of these 99 are on the Louisiana side and 19 on the Texas side. Of the 99 on the Louisiana side 8 are listed in the table as "dead" and 20 are listed as "off production." Of the 19 on the Texas side 3 are listed as "off production."

Rodessa has 656 wells of which 376 are on the Louisiana side and 280 on the Texas side. The per-well average on the Louisiana side is 132 barrels and on the Texas side, 154 barrels. Louisiana side's daily average production is 49,576 barrels and Texas' 42,321 barrels, a total for the field of 91,987 barrels, or a field average per well of 142 barrels.

EAST TEXAS

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
JOINER AREA—		
Atlantic Ref. Co., R. W. Fair 21 (100-ac)	7700	3695
W. H. Gant, Garvin-Wegener, J. W. Harris 18 (394.58-ac)	600	3603
Stanolind, H. C. Maxwell 28-A (111.65-ac)	9200	3783
Sutton & Hawkins, M. E. Church Lot 7 (15.3-ac)	480	3791
Texas Canadian Oil Corp., F. J. Cox 4	¶	900
Texas-Gulf Prod. Co., Hodnett-Melton 8 (134.8-ac)	600	3691
Tide Water Associated, J. M. Finney 7-A (40-ac)	2000	3701
L. B. Rollins 4 (22-ac)	4500	3646
KILGORE AREA—		
Delta Drl. Co., L. L. Alexander 3 (3¾-ac)	500	3528
Empire O & R Co., E. L. Walker 12 (152.21-ac)	2500	3689
Gulf Oil Corp., O. R. Baton 11 (56.71-ac)	100	3696
Hamilton & Ellis, W. D. Utzman 5-A (59-ac)	240	3510
W. D. Utzman 6-A (59-ac)	600	3551
Henry Oil Co., S. S. Laird 7 (8-ac)	8500	3562
Humble, J. A. Knowles 25 (100-ac)	3600	3622
J. E. Sexton 10-A (68.8-ac)	9000	3724
Magnolia, N. Utzman 14 (87½-ac)	50	3525
McCullough & Zilkey, Elder 2 (10-ac)	120	3589
Elder 3 (10-ac)	240	3591
Potter Bros. Prod. Co., J. Gelber 2 (1.65-ac)	2500	3500
Tide Water Associated, M. G. Barton 31 (194-ac)	9000	3615
Wheelock & Collins, D. Wells 18 (120-ac)	360	3715
LONGVIEW AREA—		
Amerada Pet. Corp., L. R. Hearne 15 (107-ac)	4600	3534
L. R. Hearne 17 (107-ac)	5000	3508
Ben G. Barnett et al, O. J. Phillips 2 (100-ac)	3000	3730
J. E. Bristow, Winn & Bailey, W. A. Moore 7 (28-ac)	9300	3532
Faith Oil Corp., J. C. Barnett 20 (140-ac)	3600	3696
J. W. Harrison (was Dave McVey) M. B. Briggs 1 (2½-ac)	120	3764
L. G. S. Oil Corp., D. W. McQueen 1-C (94.54-ac)	4000	3575
Joe Long Drl. Co., J. M. Hamby 1 (50-ac)	*	3618
Magnolia, W. R. Nicholson 7 (49.16-ac)	..	....
Monte Oil Co., W. F. Smith 8 (50-ac)	120	3720
P. H. Pewitt et al, L. A. Williford 7 (133-ac)	1500	3729
B. H. Rogers et al, W. J. Evers 3 (44.11-ac)	360	3874
Rudco O & G Co., W. R. Nicholson 7 (113½-ac)	1200	3657
W. F. Sorrells et al, A. N. Brawley 2 (30-ac)	192	3766
Stanolind, McKinley Bros. 56-B (60-ac)	8000	3621
Sun Oil Co., M. C. Satterwhite 16 (89.85-ac)	10,000	3651
Sun-Seaboard Oil Corp., J. M. Haynes 38 (203-ac)	..	....
Tide Water Associated, J. J. Castleberry 28 (202-ac)	1200	3641
B. Moore 15 (90-ac)	9500	3551
ANDERSON COUNTY (Long Lake)—		
Tide Water Associated-Seaboard Oil Corp., C. L. Smith 1 (69-ac)	¶100	5306
FRANKLIN COUNTY (Talco)—		
W. B. Hinton et al, A. Owings 3 (40¾-ac)	306	4320
Humble, A. L. Truett 1 (101.2-ac)	780	4315
P. J. Dawson 3 (80.45-ac)	†	1550
Stroube & Stroube, J. A. Hedrick 1 (65-ac)	10	4290
The Texas Co., H. C. Barker 1 (79.6-ac)	250	4277
HOPKINS COUNTY (Sulphur Bluff)—		
W. L. Goldston-Normandie Oil Co., Smith 8 (450-ac)	960	4518
F. D. Jones et al, A. A. Basham-Gulf 1 (207-ac)	500	4541
TITUS COUNTY (Talco)—		
Byrd-Frost, Inc., F. Batson-Gulf 3 (30.58-ac)	336	4275
J. Hargrove-Gulf 3 (74-ac)	306	4250
G. M. W. Oil Co., Talco Townsite 1-A, lot 1, blk 43	240	4303
Jack Hearrell & Burnett, J. G. Barber 1, lot 4, blk 21	280	4355
W. B. Hinton et al, M. B. Coker 4 (75-ac)	423	4240
Housh & Thompson, Inc., L. Blackburn 2 (33 1/3-ac)	520	4325
R. E. Moore, Tr., J. A. Moore 2 (14.16-ac)	585	4300
John O'Neal & Rotondi, W. F. Edwards 2 (10-ac)	268	4310
Yandell Rogers et al, Kelley 1, lot 3, blk 20	220	4300
Tide Water Associated, C. M. Carr 8 (75.37-ac)	308	4282
Tysco Oil Co., Edwards 1 (20-ac)	400	4280
A. M. Yost et al, Methodist Church 1, lot 1, blk 28	344	4303
HOPKINS COUNTY—		
H. & W. Development Co., Pan-American Life 1 (130-ac)	*	4456
CASS COUNTY (Rodessa)—		
Ark. La. Gas Co., George 1, Wm. R. Meyers sur	¶96	5980
Magnolia Pet. Co., Thacker & Thompson 1, Jacob Carsner sur	*	6675
Phillips Pet. Co., Skinner 4, SFIW sur	75	5958
CASS COUNTY (Douglassville)—		
McAlester Fuel Co., J. J. Dooley 1, Calloway Davis sur	*	6508
MARION COUNTY—		
The Hunter Co., E. W. Fonda 1, A. de los Santos Coy sur	283	6096
PANOLA COUNTY—		
Socogee Gas Corp., J. M. Trosper 1, Larkin Smith sur	12	2445
SHELBY COUNTY—		
H. A. Stebbinger, Pickering Lbr. Co. 2, A. Hanson sur	¶3	5126

*Failures; †Junked; ¶Million cu. ft. gas.

WOULD INVESTIGATE

Celaya proposes another interim probe committee

Austin.—A resolution proposing another interim investigating committee for the oil industry, similar in membership and sponsorship to the one created by the 44th legislature, is awaiting a vote in the Texas house of representatives. Test votes indicate its creation is almost a certainty.

The resolution creating the committee was sponsored by Rep. Augustine Celaya of Brownsville, who was chairman of the former committee. It makes no specific charges against any one, and Celaya told the house, during debate, that he was not seeking to "get" any state department or official. He said that the prior committee had produced such good results that he felt its continuation would be a good thing for the industry.

Representatives of the oil industry around the legislature have voiced no objections to the investigation.

Watching Corpus Area

According to Celaya, East Texas is in good shape and needs no investigation; but some of the "hot oilers" who formerly operated in that field have removed their operations to other new fields. He hinted broadly that he was particularly concerned with Corpus and other Southwest Texas areas.

As justification for the creation of the committee, Celaya pointed to the fact that in one instance alone, the committee more than paid for itself. That was in placing a higher bond on the fly-by-night refineries.

It was found that a lucrative racket could be operated by these refineries by sacrificing the bond posted to assure payment to the state of gasoline taxes. With a maximum bond of $25,000, a fairly efficient refinery could in two months—the approximate time between starting operations and making the first report to the comptroller—show a clear profit in taxes alone of $40,000 to $50,000 over and above the amount of the bond.

The original owner of the refinery could claim he was merely renting it to another party and he didn't know where the lessee had disappeared to.

The resolution, however, was the occasion for many of the usual remarks against the oil industry. Members thought it "peculiar" that Celaya, who voted against oil taxes, should want to spend the state's money working for the oil industry. "All hell," said another member, couldn't check up on whether major companies were running hot oil, and the only ones who would be injured would be the "little fellows."

Wichita Falls.—Panhandle Refining Company, Wichita Falls, will enlarge the capacity of its crude skimming plant at Lueders, Texas, from 700 to 1000 barrels daily. Officials of the company are considering the installation of a cracking unit, according to reports. The plant is connected by pipe line with high gravity oil areas in Jones and Shackelford Counties.

Two wildcat strikes revive Mirando trend.

* * *

Pearsall test is drilling below 10,000 feet.

* * *

Lower Edwards Plateau has show in Ordivician.

San Diego.—Mirando district, which for several months has been showing a decline in activity, again comes to the fore with two wildcat discoveries and a barrage of new wildcat locations through the trend.

Edwin M. Jones' Harry Ezzell 3, extended the Loma Novia sand zone approximately 35 miles to the northeast in the opening of the Ezzell field, four miles west of Simmons City in McMullen County. The well flowed 186 barrels of 19.7 gravity pipe line oil the first 24 hours through ¼-inch choke after perforating casing at 1523-33 feet with 30 shots. The well had been drilled to 1534 feet and casing set on bottom.

The discovery well is located NW SE SE Section 20, Ezzell Ranch Subdivision, and is just south of the Nueces River. It is several miles south of two gassers completed in about the same horizon recently by this operator. The new producer, likewise, is in one of six 3,000-acre blocks out of the Ezzell Ranch held by Mr. Jones, each requiring the drilling of at least one test well. Several locations on the other blocks already have become active.

The nearest Loma Novia sand production is in the Labbe and Seven Sisters fields, which are in northern Duval County.

Frio Produces at Seven Sisters

The Seven Sisters area again came into prominence with the discovery of Frio sand production in A. J. Brinkoeter's P. G. de Rodriguez 3, which pumped at the rate of 170 barrels of clean oil per day from sand at 1559-66 feet. The well is 676 feet east of Rodriguez 2, in Section 212, and is about one mile southwest of the main production in the field. The rig is being skidded 50 feet for a test to the Loma Novia sand. Several wells in the general vicinity showed oil in fair quantities in this horizon five or six years ago, but their completion was unsuccessful. The same sand showed gas in the main field, several blow-outs occurring from the rather high pressure.

The discovery of Frio sand production, which is about 200 feet above the top of the Jackson, in this field opens a vast new area to exploration and a possible new shore line. The Frio has produced both oil and gas in the Driscoll field, about 25 miles due south and in the Mount Lucas and Sandia fields about 35 miles to the northeast. Neither are as high up-dip as this new producer, hence, it is likely that there will be a rather interesting play along the new established zone.

Navarro Pays $1000 Per Acre

Four new producers were completed in North Sweden field, Duval County, to bring the field's total to six. The completions included extensions to the west, south and north for this new area. The most important development, however, was the establishment of values in the field through a deal made by the Navarro Oil Company for 357 acres slightly more than one half mile west of production. This company is reported to have paid $500 in cash and a like amount in oil per acre for these tracts. They include the NE Section 11 and SE Section 8, being held in fee by Rossi family.

Hiawatha Oil & Gas Company's George Herberger 2, just northeast of production in the original Sweden field, swabbed about 50 barrels of fluid, half oil and a like amount of water, after perforating at 5080-84 feet. The well originally had drilled to 5914 feet, but failed to produce in the fields regular sand. This sand likely is a new horizon for the field. A test just west of production made a gasser at 5100-05 feet, but it apparently is considerably deeper in the geological column.

Active exploration may follow Zavalla County discovery

San Antonio.—Further trading in the newly established Edwards limestone trend in the western portion of the Balcones Fault zone brings rise to a possible active exploratory campaign in the immediate future. It is not likely that there will be a drilling program of line fight proportions as the majority of the acreage is held in large units, mostly ranches.

Humble Oil & Refining Company, Magnolia Petroleum Company, Benedum & Trees Oil Company, Wilcox Oil & Gas Company, Plymouth Oil Company, Holland Oil Company and several others control at least 125,000 acres immediately adjacent to the newly completed Batesville field discovery well in Zavalla County.

The well, H. F. Wilcox's T. J. Gilliam 1, was given a seven-hour production test, during which time it put 1470 barrels of oil, at the rate of 210 barrels per hour, into a 5,000-barrel steel storage tank. The fluid level in the tank rose 7 feet during the test. The fluid has a temperature at the well head of 124 degrees, the gravity being 22 at 103 degrees and correcting to 16.6. The test was made through six-inch flow line connected to the open seven-inch casing. The fluid carried about 1½ percent water, said to be salt and sulphur.

The above producer apparently is in the Edwards limestone at 3941-47 feet, casing being set at 3930 feet.

Drilling at 10,210 Feet at Pearsall

Pearsall field, Frio County, also was in the limelight with Amerada Petroleum Corporation's second 10,000-foot operation drilling ahead at 10,210 feet in lime and sand. The well is believed to be in the upper phase of the Trinity at this level and will be watched with great interest. This test is the deepest ever drilled in South Texas. In the same field, Halff and Oppenheimer 1, attempting to complete in the top of the Edwards limstone, had another bad cement job and has recemented. The well is bottomed at 6341 feet.

Several minor extensions were provided through the completion of outpost wells in the South Darst Creek, Zoboroski fields of Guadalupe County, and the Branyon District of Caldwell County.

May get Ordovician oil in Edwards County wildcat

San Antonio.—Prospects for Ordovician production in the lower Edwards Plateau appeared more promising than ever before with Dan Auld's Mrs. Mamie Rigsby 1, Edwards County wildcat, filling 30 feet with high gravity oil after drilling two feet of lime to 3922 feet. The test immediately was shut down for orders, but will resume drilling to test this showing.

The well is located 330 feet from the north line and 660 feet from the west line of Section 16, Block O. K. in GC&SF Railway survey, about three miles east and seven miles north of the northwest corner of Real County. It is on acreage farmed out by The Texas Company.

The well topped the Bend lime at 3610 feet, White lime at 3610 feet, Mississippian at 3830 feet and Ellenberger around 3855 feet.

Midland, Texas.—Wickett Refining Company, owner of a skimming plant at Wickett, Texas, has boosted its capacity from 1800 to 3000 barrels daily through the addition of a pipe still, which was formerly in service at the nearby plant of the Bluebonnett Oil Refining Company. The latter concern has dismantled its plant. Wickett Pipe Line Company supplies the Wickett Refining Company with high-gravity crude from the Grand Falls area, Ward County, and surplus runs are loaded aboard cars at Wickett on consignment to McNutt Oil & Refining Company's refinery near El Paso.

SOUTH TEXAS Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
SAN ANTONIO DISTRICT		
BASTROP COUNTY—		
Marts & Beavans, R. A. Harris 1, 1000 ft nwl 330 ft nel 106 ac tr, Timothy McKean Sur	*	2898
BEXAR COUNTY—		
Jim Beard et al, Juan Barragon 4, James Simpson Sur (Von Ormy)	5	667
CALDWELL COUNTY—		
Louis Crouch, Ed Starcke 5, C. Crenshaw Sur (Larremore)	65	1264
Easton & Manning, W. T. Cude 1, Wm. Spiller sur (Buchanan)	240	1980
Russom Mallory, Hal Browne 1, J. R. Miller Sur (Branyon)	300	2056
Sherman Nelson, W. S. Clark 1, R. Miller sur (Branyon)	300	2065
H. A. Pagenkopf & L. C. Jamieson J. M. Hanson 1, James Hinds Sur (Salt Flats)	150	2652
Swearingen & White, Union Central Life Insurance Co. 1, John A. Neill Sur (Branyon)	40	2126
Taylor Ref. Co., J. M. Branyon et al 4-A, D. Cooper Sur (Branyon)	40	2180
J. C. Van Wagner, Mrs. A. C. Bridges 2, Solomon Seal Sur (Dunlap)	†	2429
GUADALUPE COUNTY—		
J. Kenneth Blackmar et al, Cora & J. E. Mackey 1, James Hodges Sur (Manford) 900 ft nwl 150 ft nel 179-ac tr	25	2662
J. E. Clark, Paul Knodel 1, 150 ft el & 450 ft nl (Guadalupe River) of 100-ac tr Green DeWitt Sur (S. Darst Creek)	120	2493
Louis Crouch et al, Mary E. King 1, 150 ft wl & 315 ft s of Guadalupe River, 80-ac lse, J. B. Clements Sur (Zoboroski)	20	2230
H. Dolan et al, State of Texas 1, J. D. Clements Sur (Zoboroski)	†	2227
Felmont Oil Corp., Lizzie Schueneman 1, 550 ft n 150 ft e of se cor/ Martin Hoffman Tr in Green DeWitt Sur No. 11 (Zoboroski)	125	2526
La Jita Corp., Dan J. Denman 4, Wm. Arrington Sur (S. Darst Creek)	95	2456
Floyd McGowan et al, Ada Williams 1, Green DeWitt Sur (S. Darst Creek)	240	2340
W. J. Walton, Emma Hoffman 4, Green DeWitt Sur (Zoboroski)	17	2433
MEDINA COUNTY—		
R. S. Bynum, Jr., Mary V. Melton 2, James Fricker Sur (Ina)	3	927
WILLIAMSON COUNTY—		
David Kinsey, Henry Hartman 1, Hamilton White Sur (Byersville)	*	350
ZAVALA COUNTY—		
H. F. Wilcox, T. J. Gilliam 1, 330 ft nl & el of sw¼ sec 11, blk A-2 G.W.T. & T. RR Sur (Batesville)	5000	3947
LAREDO DISTRICT		
DUVAL COUNTY—		
Benedum & Trees Oil Co., F. Vaello Puig 1, San Andres Gr (N. Sweden)	450	4752
A. J. Brinkoeter, P. Garza de Rodriguez 3, Sur 212 (Seven Sisters)	170	1566
Conservative Oil Co., DCRC-Saentz 6, Sur 52 (Colmena)	220	1452
Cox & Hamon, Yoakum-Green 1, Sec 118 (Hoffman)	50	2724
Frank J. Gravis, F. Vaello Puig 2, San Andres Gr. (N. Sweden)	450	4796
Hiawatha O&G Co., Geo. Herberger 2, sec 14 (Sweden)	50	5914
Southland Life Insurance Co. 2, Sec 15 (Sweden)	¶15	5939
Humble O&R Co., Mucio Vela 16, Sec 42 T.T.RR Sur (Loma Novia)	175	2708
Magnolia Pet. Co., Mrs. Emma (F. W.) Herbst 15, Villareal Sur (Loma Novia)	35	2764
Geo. Parr Oil Co., F. Vaello Puig 1, 330 ft sl & wl of lse in San Andres Gr (N. Sweden)	375	4800
Rio Bravo Drlg. Co. & Geo. Coates Inc., W. R. Peters 5-B, Sur 29 (Ranch Solo)	85	1835
Russ Pet. Corp. et al, A. Faris 1, 330 ft sl & el of ne¼ of sec 9, Sweden Subd, Santos Flores Gr (N. Sweden)	450	4804
The Texas Co., D. Ruiz Estate 5-B, Sur 41 (Loma Novia)	120	2581
JIM HOGG COUNTY—		
T. O. Shappell Oil Co., Thompson 1, 150 ft nl & el blk 2 sh 2, Las Animas Gr Thompson subd	*	1325
McMULLEN COUNTY—		
Edwin M. Jones, Harry Ezzell 4, 330 ft nl & wl se¼ se¼ sec 20, Ezzell Ranch sub, H. Russell Sur No. 12	350	1534
STARR COUNTY—		
G. E. Dodd, Trustee, Ben D. Wood 2-A, Por 84 (S. Ricaby)	800	1750
F. P. Schwab & Fred Foster Antioco Munoz et al 1, 350 ft swl of 1475-ac farm & 3375 ft se of el Javali Grant, 2 mi w of Cuevitas Field 94-ac tr (Griffith)	*	2309
WEBB COUNTY—		
Highland Oil Co., A. M. Bruni Est. 1-B, Sec 7 (Bruni-Cole)	250	3450
O. W. Killam, Garcia & Villareal 2, Sec 109 (Killam)	¶10	2033
Smith & Hamill, S. Benavides 7-A, Myrtle E. Hale Subd, blk 347 (Cole-O'Hern)	*	3012
Garcia & Villareal 2, Sur 1099 (Killam)	¶5	2016
Superior Oil Co., W. C. Billings 21, Sur 109 (Lopez)	220	2299
W. C. Billings 22, sur 109 (Lopez)	185	2285
ZAPATA COUNTY—		
Earl Callaway, Belen Bustamante 3, Comitas Gr, sh 8 (Escobas)	40	1207
Belen Bustamante 6, sh 8 Fansler Partition, Comitas Gr (Escobas)	40	1204½
Dalport Oil Corp., Carlos Vela 1, por 20, 640-ac tr (Lopena)	*	2541
Glenn Hammoun et al, M. Garza Est. 8, blk 10, C. A. Douglas sub	33	1292
Nordan & Morris, C. Bustamante 5, sh 33 Fansler Partition, Comitas Gr (Escobas)		121257
C. Bustamante 7, sh 33 Fansler Part, Comitas Gr (Escobas)	20	1233
C. Bustamante 8, sh 33 Fansler Part, Comitas Gr (Escobas)	20	1226
C. Bustamante 9, sh 33 Fansler Part, Comitas Gr (Escobas)	18	1210
C. Bustamante 19, sh 33 Fansler Part, Comitas Gr, (Escobas)	33	1239
C. Bustamante 20, sh 33 Fansler Part, Comitas Gr (Escobas)	†	1236½
Texas Pipe & Supply Co., M. Bustamante 4, sh 9 Fansler Part, Comitas Gr	40	1188
M. Bustamante 5, sh 9 Fansler Part, Comitas Gr	42	1189
Westheimer & Daube, E. Lopez 1, 150 ft swl, 150 ft sel, blk 7, Sur 288	*	2100
CORPUS CHRISTI DISTRICT		
ARANSAS COUNTY—		
Buckingham Oil Co., McCampbell Ranch 7-A, James Orrick Sur (McCampbell)	300	6551
Landreth Prod. Co., McCampbell Ranch 2, lot 4, sec 4 (McCampbell)	650	7120
BEE COUNTY—		
Ann Oil Co., G. V. (Jane) Smith 2, J. R. Johnson Sur (Plumber)	250	3059
BROOKS COUNTY—		
Standard Oil of Texas Co., Mestina O&G Co. 6, 2332 ft el & 7634 ft most nrthly nl lse No. 1, 2332 ft nl & el sh 5, R. G. Salinas Gr (Alta Mesa)	150	3002
CALHOUN COUNTY—		
Humble & Plymouth, P. H. Welder 12-A, Agathon Sisneros Sur (Heyser)	650	5485
GOLIAD COUNTY—		
Goliad Oil Co., S. E. Cole 1, 206 ft wl 527 ft sl of 10-ac tr, lot 33, range 4, Goliad Town Gr	¶70	5544
JACKSON COUNTY—		
Steinberger Pet. Corp. et al, S. G. Druschell 8, Rodriguez Sur (Edna)	¶60	5402
Texas Co., Martin Hultquest 1, D Dempsey Sur (Ganado)	¶3&5	5150
JIM WELLS COUNTY—		
Tom Graham & Gilcrease Oil, C. M. Laughlin A-2, S. K. & K. Sur (Premont)	¶5	3221
C. M. Laughlin 2-B, Sec 77 (Premont)	¶3	3221
Smith & Storey, C. A. Buldue 1, S. K. & K. Sur (Premont)	150	2356
KARNES COUNTY—		
Magnolia Pet. Co., Guy Porter 14, Spencer Morris Sur (N. Pettus)	50	3666
NUECES COUNTY—		
Allen & Morris, Solar-Sevier 1-B, Villareal Gr (Saxet)	125	4858
Clarkwood Oil Co., H. B. Baldwin 1, 330 ft wl 990 ft sl, blk 11, Russell Farm Lots	*	7040
Crown Central Pet. Corp., J. B. Hunter 1 (No. 4) page Sur (Saxet)	150	4813
Gilcrease Oil Co., Hattie Sullivan 3, Thos. Gallagher Sur (Saxet)	91	5565
Hiawatha Oil Co., Hutchins-Stillwell 8, blk 30, Sheppard Farm Lots (Saxet)	450	7003
Hutchins-Stillwell 9, blk 34 (Saxet)	140	6758
F. J. Smith 5-B, blk 35, Sheppard Farm Lots (Saxet)	625	5847
Houston Oil Co., E. McGregor et al 9, sur 582 (Saxet)	500	6732
Rand Morgan 24, Sec 7, Range 5 (Saxet)	700	4420
Humble & Barnsdall, B. Dunn 1, Lot 5, Sec 41 (Flour Bluff)	750	6663
Josie Miller 5-B, Sec 20, blk 48 (Flour Bluff)	500	6663
Republic Natural Gas Co., V. M. Donigan 5-A, Sec 6 & 7, Range 6 (Saxet)	¶20&50	4875
John Dunn 19, blk 37, Sheppard Farm Lots (Saxet)	500	4861
Richardson Pet. Corp. F. Quiros 9, Sur 311 G. C. & S. F. (Saxet)	475	5850
J. B. Sedwick 5, Sur 311 G. C. & S. F. (Saxet)	450	4902
Shell Pet. Corp., Ed Flato 4, blk 4, Sheppard Farm Lots (Saxet)	650	4548
Texon Royalty Co., Clara Driscoll Sevier 2-B, Polo Blanco Gr (S. Agua Dulce)	¶10&50	6465
REFUGIO COUNTY—		
Quintana Pet. Corp., Tom O'Conner	48-A,	
Swisher Sur (Tomoconner)	2650	5940
United Prod. Corp., M. F. Lambert 45, Swisher Sur (Tomoconner)	1250	5910
M. F. Lambert 52, (Tomoconner)	1000	5919
SAN PATRICIO COUNTY—		
L. A. Cage Prod. Co., J. W. Mayo 9, N. W. Ottman Sur (Taft)	450	4007
Humble O&R Co., J. W. Mayo 23, J. N. W. Ottman Sur (Taft)	400	4365
VICTORIA COUNTY—		
Magnolia Pet. Co., Charlie Sklar 8, S. A. & M. G. Sur (Placedo)	240	4774
Superior Oil & Gas Co., J. Hosek 5, S. A. & Mg. Sur lot 7, (Placedo)	350	4772
Union Oil Co. of Calif., Claude A. Keeran 4, M. de Leon Sur (Keeran)	1000	6002

*Failures; †Junked; ¶Million cu. ft. gas.

To test Conroe sand in Barbacoas field

Mission. — Production test was expected to be made over the week end in K. E. Merren's Starr County Cattle Company 1-A, Conroe sand test in Barbacoas field, Starr County. The well is the first to drill successfully to its desired depth, three others failing, largely due to high gas pressure.

The above well, located in Block 34, Porcion 89, had sand and shale streaks and several fair sections of sand between 5358-5417 feet. A string of 7-inch casing had been set at 5353 feet for production and 5-3/16-inch liner cemented to the bottom of the hole. The cement apparently did not hold as a test on the well showed 2700 pounds closed in pressure on tubing and maintained 900 pounds on casing. The well was flowed through ½-inch choke on the casing for a period of 10 hours in effort to bleed off the excessive pressure. When the tubing was run into the hole, mud was pumped in and the test killed. Any cement left in the liner then was drilled out and preparations made to perforate below 5383 feet.

New Sand and Extension for Alta Mesa

An extension of more than ½-mile to the north and the establishment of a new producing horizon in the Alta Mesa field, Brooks County, resulted from the completion of Standard Oil Company of Texas' Mestina Oil & Gas Company 6, which flowed 111 barrels of oil in 24 hours through 20/64-inch choke. The tubing pressure varied from 25 to 100 pounds, while the casing pressure varied from 250 to 400 pounds. The test was completed in sand at

2992-3002 feet, casing being set at 2986 feet.

One 8000-foot test has been started, and tentative locations are reported to have been staked for three more tests to the same level in the new LaBlanca field of Hidalgo County. Preparations are being made to spud in Davenport & Swallow's C. H. Swallow 1, southeast offset to a producer on the McDougal land. Atlantic Refining Company is reported about ready to commence wells on the T. T. Sanders and J. C. Engelman tracts, each to offset present producers. Fohs Oil Company, likewise, is expected to commence in the near future on its 400-acre lease.

Several deep wildcats in the area are at interesting levels. Shell Petroleum Corporation's Yturria 1, La Sal Viejo prospect in Willacy County, was drilling below 10,100 feet to be the deepest test ever drilled on the South Texas Gulf Coast. One test in Cameron and the other in Willacy County, to be drilled to 5000 and 7500 feet, respectively, have been started, while Saxet Production Company has started an 8500-foot hole.

Third attempt develops gas field in Goliad Townsite

Beeville.—Production on the Goliad Townsite prospect in Goliad County, finally has been established after two failures due to excessive gas pressure. The discovery well is Goliad Oil Company's S. E. Cole 1, which made 20,000,000 cubic feet of gas after completing through drill pipe. It is showing 3250 pounds working pressure through ½-inch choke.

The well recently drilled to 5544 feet, 18 inches in sand, started to blow out, was controlled, but stuck the drill stem. All efforts to recover the pipe failed.

This new producer, which likely is in the Cockfield, is located 206 feet from the west line and 527 feet from the south line of Lot 32, Range 4, Goliad Townsite. Rig has been skidded 660 feet to the east and a second well commenced.

Win Conroe land suit

Austin.—After a month's trial, a jury in 126th District Court here this week ruled on all points for defendant oil companies in a suit in which the state sought to establish a 250-acre vacancy in the Conroe oil field.

The state had sought to prove a vacancy in Sections 13 and 14 of the Washington County Railroad Grant. Defendant oil companies included Humble Oil & Refining Company, Amerada Petroleum Corporation and Navarro Oil Company.

The state gave notice of appeal.

Louisiana issues 10 permits

Shreveport. — Ten drilling permits were authorized last week by the minerals division, Louisiana Conservation Commission, of which five were for North Louisiana divided among the following parishes: Caddo, three; Rapides, one; and Red River, one. The five in South Louisiana were divided among the following parishes: Acadia, one; Cameron, one; La Fourche, one; and Terrebonne, two.

TEXAS GULF COAST

Segno gets new sand and extension.

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Humble stakes location for wildcat at Friendswood.

Houston.—Probably the most important developments in the Texas sector of the Gulf Coast last week were the discovery of a new producing sand and the extension of Segno field, Polk County.

J. K. Dorrance, discoverer of Segno, found a new producing sand last week when Wing 4 came in from lower Cockfield formation flowing at the rate of 610 barrels of 44 gravity pipe line oil daily through a quarter-inch choke, with a tubing pressure of 1500 pounds and a casing pressure of 1750 pounds, after casing had been perforated with 15 shots from 5241 to 5246 feet. Wing 4 was drilled to 5247 feet; seven-inch casing was cemented on bottom.

Completion of Humble Oil & Refining Company's Kirby Lumber Company B-3, over a mile southeast of production at Segno, M. Victor Survey, Polk County, indicates that Segno will be of major importance. Kirby Lumber Company B-3 came in flowing 21 barrels per hour through a quarter-inch choke, with a tubing pressure of 550 pounds and a casing pressure of 700 pounds, from lower Cockfield sands at 5340 feet. The previous week the well was tested through the drill stem and it flowed 20 barrels per hour through a quarter-inch choke. The company made location for Kirby Lumber Company B-4, 933 feet east of Kirby B-3.

Silsbee Also Extended

Silsbee, Hardin County, was extended 933 feet east when Republic Production Company completed Brooks 14, G. W. Brooks Survey, at 6915 feet. The well was flowing into tanks through a quarter-inch choke, with a tubing pressure of 1575 pounds and a casing pressure of 2000 pounds. No gauge has been taken on the new producer. It was drilled to 6915 feet and logged the top of the sand at 6898 feet and set seven-inch casing at 6908 feet.

On the north side of High Island field, Galveston County, Stanolind Oil & Gas Company found commercial production in Cade B-1, M. Dunman Survey, approximately 435 feet deeper than any other producing well in the field. Cade B-1 was drilled to 7179 feet and plugged back to 6715 feet. Casing was perforated from 6695 to 6710 feet and the well flowed 332 barrels of pipe line oil daily through a 3/16-inch choke, with a tubing pressure of 1200 pounds and a casing pressure of 740 pounds.

Humble Oil & Refining Company announced location for a wildcat on the Friendswood prospect, about mid-way between Genoa gas field and Hastings oil field. J. J. Settegast 1 is 466 feet out of the northeast corner of Lot 63 E in the Perry & Austin Survey, Abstract 20, Galveston County.

Three Good Ones at Dickinson

Three good producers were completed at Dickinson field Galveston County, last week. Stanolind Oil & Gas Company's Damiani 2, the second well for the company in the southwestern portion of the Dickinson field, made 810 barrels daily through a quarter-inch choke, with a tubing pressure of 1500 pounds and a casing pressure of 1650 pounds from 8800 feet. Seven-inch casing was set at 8638 feet.

In the northwestern portion of Dickinson field, which is sometimes referred to as Diadem field, Atlantic Refining Company completed its second well. Sealy Hutchins Roberts 2, P. G. Merritt Survey, made 671 barrels daily through a quarter-inch choke, with a tubing pressure of 1100 pounds and a casing pressure of 600 pounds after casing had been perforated from 8087 to 8092 feet with 20 shots.

Ken Ben Oil Company received credit for completing the third producer at Dickinson. Maco Stewart 4, W. K. Wilson Survey, flowed 632 barrels in 24 hours through a quarter-inch choke, with a tubing pressure of 1200 pounds and a casing pressure of of 1500 pounds. The 39.4 gravity oil is coming from around 8647 feet.

Second Sandy Point Completion

North of the discovery well at Sandy Point, Brazoria County, Florence Investment Company's Fite 1, D. Talley Survey, was completed for 15 barrels of 48 gravity oil daily through a ⅛-inch top and bottom hole choke, with a tubing pressure of 650 pounds and a casing pressure of 2400 pounds. The well was completed at 6475 feet probably in a different sand from that of the discovery well.

Jack Frazier's Sharp 1, in the Sandy Point area, G. S. Gorbett Survey, was coring shale below 6672 feet at the end of the week and was running over 200 feet lower structurally than the discovery well.

United North & South Development Company's Stoddard 1, approximately

three miles southwest of Buckeye field, M. Cotton Survey, Matagorda County, was swabbing oil and water at the end of the week from 9945 feet. The well attempted to blowout. Two and one-half inch tubing was hung at 9926 feet.

Glenn H. McCarthy's Foley Land Company 2, second well at Palacious, L. Goodwin Survey, Matagorda County, was coring shale at 7913 feet after logging several sands and shales which carried showings of both oil and gas.

In the Lakeview area, Wharton County, Smith & McDanniel's Martin 1, I. G. N. Survey 16, was abandoned in salt water sand at 5905 feet after topping the sand at 5902 feet. A salt water sand was also cored from 4360 to 4410 feet and from 5290 to 5303 feet.

Clay Creek Test In Anhydrite

Sun Oil Company's Draeger 6, north outpost test at Clay Creek, J. F. Perry Survey, Washington County, was drilling in anhydrite at 3498 feet at the end of the week after logging top of the cap rock at 3375 feet. The company will make a deep test out of Draeger 6. It is the opinion of geologists that the company will drill through the salt and find production lower. It is known that Clay Creek field is a "mushroom" type dome.

Temple Hargrove and H. C. Cockburn's Forester 1, in the New Ulm area, A. J. Bell Survey, Austin County, at 3850 feet tested water on a drill stem test. In eight minutes through quarter-inch chokes the test showed 2600 feet of water with a slight show of gas. A sand with a slight show of oil was encountered from 3746 to 3755 feet. Top of the Cockfield was logged in Forester 1 at 3500 feet.

Approximately three-fourths miles southwest of production at Fairbanks, Harris County, Amerada Petroleum Corporation and Stanolind Oil & Gas Company were attempting to place Jacobs 1, W. C. R. R. Survey, Block 1, Section 2, back on production after it had produced some oil and gone dead. Jacobs 1 made a drill stem test from 6824 to 6827 feet and the well flowed 31 barrels in seven hours through a quarter-inch choke. The crew ran tubing and on the next test Jacobs flowed 5.41 barrels in one hour through a quarter-inch choke with a tubing pressure of 250 pounds and a casing pressure of 1300 pounds. After treating the well made 51 barrels in 12 hours through a quarter-inch choke, with a casing pressure of 1200 pounds. It went dead again and at the end of the week the crew was trying to revive Jacobs 1. In the Ceder Bayou area, Harris County, H. J. DeArman et al's Tyrell & Garth 1, L. Hemingway Survey, was abandoned at 7029 feet.

At South Cotton Lake field, Chambers County, Salt Dome Oil Corporation's Lawrence 2-C, S. Barrow Survey, set seven-inch casing in Frio sands at 6504 feet. Lawrence 2-C was drilled to 6509 feet in sand showing oil after logging the top of the oil sand at 6498 feet.

Approximately 1½ miles west of production at Seabreeze field, Chambers County, Sun Oil Company completed Broussard Hebert A-1, T. & N. O. Survey, making 1,200,000 cubic feet of gas daily through ⅛-inch choke, with a tubing pressure of 3000 pounds and a casing pressure of 3300 pounds from 8460 feet. About 2½ miles southwest of production at Seabreeze the company made location for F. Jackson 1, 4200 feet south of the north line and 1400 feet east of the west line of A. Yborbo Survey, Abstract 30, Chambers County.

TEXAS GULF COAST
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
AMELIA—		
Humble, Dishman 2-A	641	6770
Dishman 1-B	648	6775
Dishman F-1	655	6779
Stanolind, J. W. Hall 1	22	6103
BARBERS HILL—		
Sun, Wilburn 17	62	4987
BIG HILL—		
Stanolind, Fitzhugh 1	14	5038
DICKINSON—		
Atlantic, Roberts 2	671	8127
Ken Ben Oil Co., Maco Stewart 4	632	8647
Stanolind, Damiani 2	810	8800
GOOSE CREEK—		
Sun, A. Smith 1	*	5057
HASTINGS—		
Navarro Oil Co., Beers 1-A	592	6065
Beers B-2	541	6082
Stanolind, Butts 1	599	6100
Elliott 2	407	6080
Paul 5	672	6080
Pennock 4	619	6080
HIGH ISLAND—		
Stanolind, Cade B-1	332	6710
HUMBLE—		
Texas Co., Landslide 273	390	3218
KATY—		
Stanolind, Hargrove 1	¶3½	7500
LAKEVIEW—		
Smith & McDanniel, Martin 1	*	5905
MANVEL—		
Texas Co., Belcher A-16	463	5675
Houston Oil Field Association 25	509	5690
NOME—		
Sun, Mouboules 1	*	8768
RACCOON BEND—		
Humble, Wilson 11	*	4287
SANDY POINT—		
Florence Inv. Co., Fite 1	15	6475
SEABREEZE—		
Sun, Hebert Broussard 1-A	¶1¼	8781
SEGNO—		
J. K. Dorrance, Wing 4	610	5246
Humble, Kirby B-3	480	5342
La Quinta Oil Co., Wing 2	480	5194
SILSBEE—		
Republic Prod. Co., Brooks 11	437	6959
TOMBALL—		
Humble, Mahaffey 4	*	5596
F. Theis 5	¶2	5545
Shell, Key 2	505	5568
Southwest Inv. Co., Hillegist 2	470	5584
WITHERS—		
Texas Co., Pierce Estate C-28	*	5771
AUSTIN COUNTY—		
Cockburn & Hargrove, Forester 1, New Ulm area, A. J. Bell sur	*	3850
HARRIS COUNTY—		
H. J. De Armand, Tyrell & Gath 1, Cedar Bayou area, L. Hemingway sur	*	7029
TRINITY COUNTY—		
West Prod. Co., Texas Long Leaf Lbr. Co. 1, se of Trinity, J. Williams sur	*	4549

*Failures; †Junked; ¶Million cu. ft. gas.

Stanolind buys control in South Gulf Oil Corporation

Houston.—Stanolind Oil & Gas Company bought controlling interest in South Gulf Oil Corporation when all of E. E. Fogelson's stock was purchased for a reported consideration of $1,250,000. E. E. Fogelson was president of South Gulf Oil Corporation.

South Gulf Oil Corporation held producing acreage in East Texas, Conroe, and Hastings field. It is rumored that the reason that Stanolind Oil & Gas Company made the deal was for the Hastings acreage in Brazoria County.

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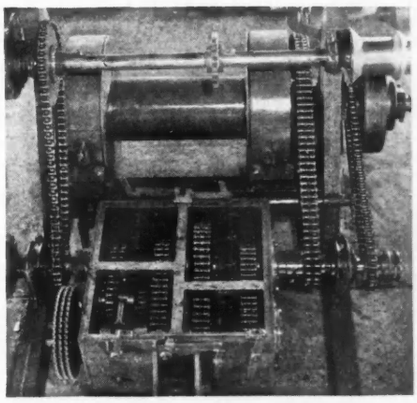

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SOUTH LOUISIANA

Two possible new fields for southern part of state.

* * *

Texaco well may extend Lafitte three quarter miles.

* * *

Now 6985-foot Darrow sand yields 744 barrels daily.

Lake Charles.—Evidence of two new oil fields in the Louisiana Gulf Coast was shown last week when two wildcats cored oil sands in Miocene formation and were setting casing. One of the wildcats will be given a production test the coming week, while the other probably will be drilled deeper as an exploratory test.

The next two oil fields may be at Long Lake and at Black Prince Island, the former in Lafourche Parish and the other in St. Charles Parish. Fohs Oil Company is the discoverer of the field in Lafourche Parish while Amerada Peroleum Corporation and Louisiana Land & Exploration Company is the discoverer of the field in St. Charles Parish.

Fohs Oil Company's State Long Lake 1, in Long Lake, Section 65-17s-19e, was preparing to set casing at 9406 feet after coring from 9368 to 9383 in sand and shale showing oil. An odor of oil was recorded from 9383 to 9385 feet and a showing of oil was logged from 9385 to 9391 feet. State Long Lake 1 was cored down to 9406 feet. In coring from 9368 to 9406 feet, 30 feet of oil sand was logged along with eight feet of shale.

There is little doubt but what the well will open a new field in the Louisiana Gulf Coast. If it does, it will be Fohs Oil Company's second oil field in the area, the first being at English Bayou, Calacsieu Parish.

S. A. Guidry leased a majority of acreage in this area and turned the block to Fohs Oil Company. He leased approximately 5000 acres from Allen Land Company and several thousand acres from the state. Fohs Oil Company worked the area with geophysical instruments and made location for State Long Lake 1. Dusson Oil & Planting Company and Cheese Realty Company have considerable acreage in the area.

Black Prince Island Wildcat Cores Oil Sand

Oil sands were cored in Amerada Petroleum Corporation and Louisiana Land & Exploration Company's State Bayou Des Allemands 1, Black Prince Island prospect, Section 13-15s-20e, St. Charles Parish. They were preparing to run a string of 9⅝-inch casing to search for sands at a greater depth.

State Bayou Des Allemands 1 cored as follows: from 6828 to 6878 feet, sand with thin streaks of shale showing oil; from 6878 to 6885 feet, sand with streaks of shale showing oil; from 6885 to 6895 feet, salt water sand; and from 6895 to 6915 feet, salt water sand. Some geologists are picking the oil showing sand as the same found at Lafitte field around 6826 feet. The 6800-foot sand has not been tested, but it is reported that there are 18 feet of sand which could make a commercial oil producer. If the sands are the same at Black Prince Island as they are at Lafitte field, then the former field may be as prolific as that of Lafitte, which is producing from 9400 to 10,200 feet.

The Black Prince Island prospect was discovered with reflection seismograph by Louisiana Land & Exploration Company and the company took around 11,000 acres in the area. The block was turned to Amerada Petroleum Corporation on a 50-50 operating basis. Felmont Oil Corporation has around 1200 acres in the district.

At one time in St. Charles, St. James, St. John the Baptist, Jefferson and Lafourche parishes, Louisiana Land & Exploration Company and Amerada Petroleum Corporation held around 40,000 acres for geophysical work. Amerada Petroleum Corporation worked part of the acreage with reflection seismograph.

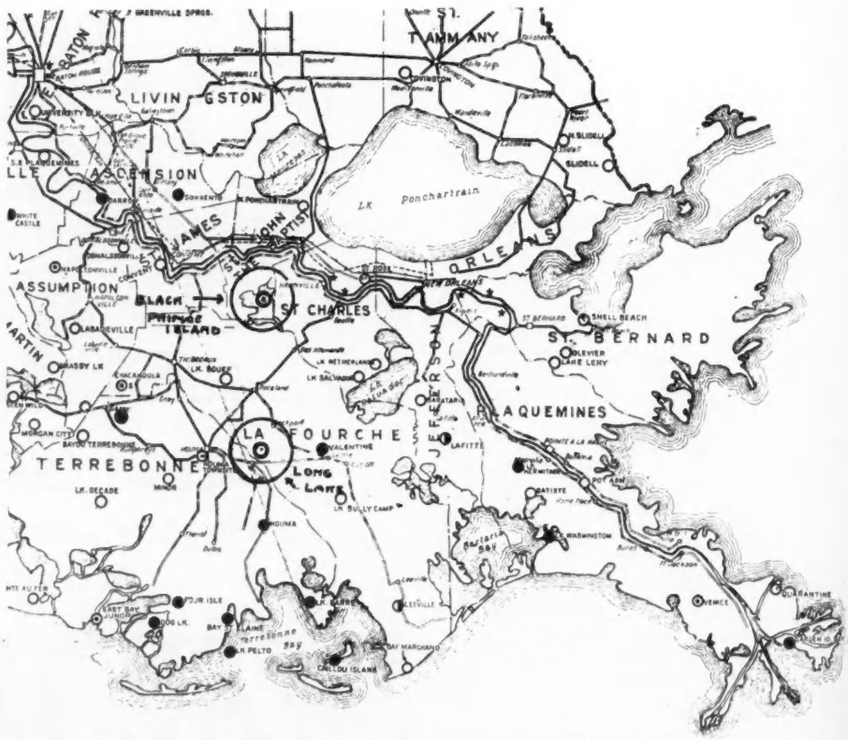
Lafitte Extension Cores Oil Sand

The Texas Company's State Bayou Norman 1, approximately ¾ of a mile east of production at Lafitte field, Jefferson Parish, was coring in shale at 9806 feet at the end of the week after coring 30 feet of hard sand showing oil from 9586 to 9616 feet. The well probably will be drilled below 10,000 feet and test lower Oligocene sands. The same operator's Rigolets 7, southeast of production at Lafitte, Section 29-17s-24e, was coring at 10,000 feet at the end of the week after coring sand and shale with a slight showing of oil from 9525 to 9568 feet.

New Sand at Darrow

A new oil sand was found 1350 feet southeast of production at Darrow dome last week when Humble Oil & Refining Company completed Landry 1, Section 34-10s-2e, Ascension Parish, flowing at the rate of 31 barrels per hour, or 744 barrels of 39 gravity oil daily, through a quarter-inch choke, with a tubing pressure of 1290 pounds and a casing pressure of 1375 pounds from sands at 6985 to 6995 feet.

Landry 1 cemented 16-inch casing at 228 feet and then a string of 10¾-inch



Showing location of the week's two new prospective fields in South Louisiana

casing at 3001 feet. After drilling to 6995 feet an 11-minute drill stem test showed 10 stands and two joints of oil through a 3/8-inch choke. Seven-inch casing was set on top of the oil sand. Landry 1 is approximately 1300 feet southwest of Humble's Gumble 9, which was abandoned below 7000 feet.

Another 10,000-Foot Well for South Louisiana

Another 10,000-foot well was established in the Louisiana Gulf Coast the past week when The Texas Company's State Bateman Lake 1, Morgan City prospect, St. Mary Parish, was drilling below 10,048 feet in shale. The company's Horseshoe Bayou 1, on Horseshoe Bayou, St. Mary Parish, should be ready to resume work soon. Operators are erecting a drilling barge over the 12,261-foot hole which blew out and caught fire some time ago.

Union Sulphur Company has made another location at Big Lake field, Cameron Parish. H. Hebert 1 is 1282 feet north and 2571 feet west of the southeast corner of Section 18-12s-8w. It is approximately 1400 feet east of J. O. Hebert 1, which was completed last week as the first commercial oil producer at Big Lake.

In Jefferson Davis Parish, Louisiana Crusader Oil Company's Langley 1, Fenton area, Section 36-7s-5w, was drilling in shale at 8238 feet after logging a show of gas from 8015 to 8022 feet. This wildcat has encountered several showings of oil and gas and is being watched very closely.

Two Drill Stem Tests at North Crowley

Humble Oil & Refining Company made two drill stem tests on Federal Land Bank 1, North Crowley prospect, Section 34-8s-1e, Acadia Parish. Both failed to recover any oil or gas. The tests were made from 7928 to 7939 feet and from 7930 to 7939 feet.

The first drill stem test, made in 12 minutes through quarter-inch chokes, recovered 10 gallons of heavy drilling mud and no oil or gas. The second test, made in 18 minutes, showed about the same. At the end of the week the crew was preparing to make another drill stem test.

SOUTH LOUISIANA
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
CAILLOU ISLAND—		
Texas Co., State 41	1280	4644
CAMERON MEADOWS—		
Magnolia-Humble, Cameron Meadows 19	*	5834
CHOCTAW—		
Standard Oil Co., Wilbert 9	*	5728
DARROW—		
Humble, Landry 1	744	6995
JENNINGS—		
Superior, Leckelt 3	552	6719
LEEVILLE—		
Texas Co., L. L. E. Leeville 64	1200	4422
NEW IBERIA—		
Canal Oil Co., Bernard 9	600	4780
PORT BARRE—		
Pan American Prod. Co., Watkins 2	*	5370
SULPHUR—		
Union Sulphur, Fee 845	510	4985
TEPETATE—		
Continental, Vincent & Welsh 1	220	8317
VALENTINE—		
Pan American Prod. Co., Harange 3	*	7718
EAST BATON ROUGE PARISH—		
Cavalier Oil Co., Jacocks 1, 69-4s-1w	*	4422
ST. LANDRY PARISH—		
Shell Boagni 1, ne Cankton, sec 48-8s-4e	*	9006

*Failures; †Junked; ¶Million cu. ft. gas.

Marion County test swabs much salt water.

* * *

Sugar Creek extension is best well in area.

* * *

Lisbon north end well has thin sand section.

Shreveport. — The Marion County, Texas, end of the Rodessa field held the center of interest in that area last week as a northeast edge well swabbed a large amount of salt water when tested in the Young horizon.

Arkansas-Louisiana Gas Company's C. C. Braden 1, Thomas Hanson Survey, near Jefferson, was coring at 6084 feet after recovering a core from 6069 to 6084 feet with fair porosity but the last four feet carried salt water, apparently condemning the Young horizon in this test. However, the test may be carried to the Travis Peak.

This test whose elevation is 211 feet, showed 20 to 30 million feet of gas with some distillate in a drill-stem test from 5924 to 5940 feet and from 5938 to 5958 feet logged coarse oolitic lime with medium porosity. In a 20-foot core from 5958 to 5978 feet the top 4 feet recovered showed oil and gas the rest of the core being tight with only gas showing. In a drill-stem test of this formation, which is the Gloyd from 5943 to 5983 feet the test showed about 15 joints of fresh water and about five million feet of gas.

Activity continues to mount around The Hunter Company's recently completed E. W. Fonda 1, A. de los Santos Coy Survey 8½ miles southwest of the Rodessa field proper, recently completed in the Gloyd at 6096 feet flowing 283 barrels of oil daily. This well's June allowable has been set at 160 barrels daily by the Texas Railroad Commission, about the amount it has been averaging in the last week. A loading rack is being constructed for this well, there being no pipe-line outlet. The allowable for June of Holcomb, Thomasson and associates' Lizzie Henderson 1, R. Bennington Survey, was left at 96 barrels daily.

Offsetting to the south The Hunter Company's E. W. Fonda 1, Fohs Oil Company has spudded McReynolds 1 in the same survey. The Hunter Company has spudded, set surface casing at 339 feet and is drilling ahead in E. W. Fonda 2, while Arkansas-Louisiana Gas Company's Allen Houston 1, in the same survey, is waiting on cement in surface casing cemented at 303 feet. Materials are also being moved in by United Production Corporation for J. H. Hutchinson 1, same survey, and by Mid-Continent Petroleum Corporation for Sory 1, also in that survey. Stumpf & McFall are surveying tentative locations for two tests in the John Hooks Survey on the H. C. Scuddy tract.

On the northeast edge of the Louisiana side of Rodessa, Drillers, Incorporated, last week was swabbing about 75 percent salt water, 15 percent drilling fluid and 10 percent oil from Glassell-Means 1, SW NE SE 9-23n-15w, at 6075 feet in 10 feet of Young lime. Seven-inch casing was cemented at 6064 feet; elevation is 302 feet. It is a north offset to Lion Oil Refining Company's Holm 1, NW SE SE 9-23-n-15w, re-

NORTH LOUISIANA
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
BOSSIER PARISH—		
Tidwell et al, Nattin 1, 15-22n-14w	*	2954
Triangle Drlg. Co., Roos Unit 2, 23-17n-12w	115	5180
State A-2, 23-17n-12w	125	5170
CADDO PARISH (Pine Island)—		
Stanolind, Dillon Heirs 122, 13-21n-15w	65	1665
CLAIBORNE PARISH—		
United Gas, W. M. Dobbins 1, 12-19n-6w	196	5660
Ray P. Oden et al, H. W. Patton Est. 2, 36-21n-5w	430	5352
J. B. Bond, H. E. Patton 2, 36-21n-5w	350	5290
L. O. McMillan et al, Maggie Patton B-1, 31-21n-4w	450	5301
LA SALLE PARISH—		
The Old Homestead O&G Co., Zenoria Lbr. Co. 1, 23-9n-1e	*	1650
LINCOLN PARISH—		
Lyons & Neely, Eva Bennett 1, 6-20n-4w	480	5342
MOREHOUSE PARISH—		
Southern Carbon Co., Miles 3, 36-21n-4e	¶2	2227
RED RIVER PARISH—		
F. G. Goelz, Teekel 1, 34-13n-10w	*	1027
SABINE PARISH—		
Producers O&G Co., Edwards Est. 5, 29-9n-13w	75	1739
W. G. Ray Drlg. Co., A. J. Burkett 3, 10-9n-13w	55	1525
UNION PARISH—		
H. L. Woods, Frost Lbr. Co. B-1, 9-21n-3e	¶1	2192
WEBSTER PARISH—		
N. V. Duncan, G. T. Baker 1 (Mayfield 1), 9-23n-9w	*	3250

*Failures; †Junked; ¶Million cu. ft. gas.

cently completed to extend production a quarter of a mile. It is also making about 10 percent salt water. Had these wells been completed earlier in the history of the field before the rise of the water line they might have produced for some time before water encroachment, engineers believe.

United Gas Company has treated with acid and rocked with gas its J. W. Land 1, Robert Potter Survey, Cass County, that indicated a gas-distillate producer from the 6500-foot level in basal Glen Rose. It has not been gauged and testing continues. Magnolia Petroleum Company has abandoned Thacker and Thompson 1, Jacob Carsner Survey that plugged back from 6675 feet.

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SHREVEPORT, LA.

Third Sugar Creek well is two-mile extension

Shreveoprt. — The Travis Peak oil producing horizon of the Sugar Creek field, Claiborne Parish, was extended over two miles last week when the field's third oil producer was completed by United Gas Company's Carter Unit 1, located 1390 feet north and 2890 feet east SWc 32-20n-5w, flowing estimated 45 barrels per hour through ¼-inch tubing choke from 14 feet of saturated formation, at 5748 feet; 5¾-inch casing was cemented at 5722 feet.

This well is by far the best of the three oil wells so far completed in Sugar Creek, the other two having had little volume. The last well was completed without using acid as was done in the previous wells. Sugar Creek is unitized among United Gas Company, Stanard Oil Company of Louisiana, and Triangle Drilling Company, having over 8000 acres. This extension apparently assures that drilling for Travis Peak down the flanks outside the unitized area will be done soon. The Texas Company has some advantageous flank acreage not in the unitization.

The Driscoll area of Bienville Parish was also assured its second Travis Peak gas-distillate well last week when Lide & Greer's W. J. Smelley 1, SE NW SW 18-16n-4w, tested 50 to 60 million feet of gas with heavy show of distillate in drill-stem test from 7100 to 7144 feet. Total depth is 7180 feet. Seven-inch casing was cemented at 7093 feet, at top of saturated formation. It checked 25 feet higher than the other Travis Peak gas producer in Section 13-16n-5w.

Standard Oil Company of Louisiana has logged top of Travis Peak at 6006 feet in Stewart 1, Section 32-21n-10w, two miles west of the deep Cotton Valley production in Webster Parish, and after coring the Holloway sand at 6027 to 6033 feet with only salt water appearing 9⅝-inch casing was being set on bottom at 6042 feet as a protection so the test can be carried to the lower Marine section which in Cotton Valley proper produces between 8000 and 8500 feet.

Lisbon north limit apparently being approached

Shreveport.—More evidence that the northern limits of the Lisbon field in basal Glen Rose lime are being neared was given last week when E. W. Gill and Associates' McDonald B-1, N½ SE NE 36-21n-5w, logged only three feet of lightly saturated lime, which was tight, but after use of acid the test apparently will make a good well at 5296 feet; 7-inch casing was cemented at 5262 feet. When first opened it flowed 30 barrels hourly.

Six other wells were completed in Lisbon last week to boost the total number of producers there to 30. Three others of these besides the E. W. Gill McDonald B-1 were edge tests. On the southeast edge of production, Lyons & Neely completed Maggie Patton A-2 SE SW 31-21n-4w, at 5286 feet flowing 20 barrels per hour at 5286 feet and H. E. Patton 2, NW SW 36-21n-5w, at 5244 feet flowing 470 barrels in 24 hours. It is a west edge test. DeArman and McMillan completed Maggie Patton B-2, SW NW 31-21n-4w, at 5301 feet, with 18 feet of saturation, and Maggie Patton A-2, NE SW 31-21n-4w, flowing 18 barrels per hour through 13/64-inch tubing choke at 5255 feet.

Magnolia Petroleum Company completed H. E. Patton 1, NE SE SW 36-21n-5w, flowing 26 barrels per hour through 23/64-inch tubing choke at 5336 feet. It was completed without use of acid. It gauged 301 barrels in 24 hours through ¼-inch tubing choke with tubing pressure 190 pounds and casing pressure, 680 pounds. P. W. Woodruff completed T. E. Patton 1, S½ SE NE 36-21n-5w, flowing 13 barrels per hour through ¼-inch choke at 5301 feet.

J. B. Bond and associates are preparing to acidize and test Burgess 1, NE SE NE 3-20n-5w, shut down for some time at 5800 feet but which had saturation in basal Glen Rose lime and it also had spots of oil in the Travis Peak at 5439-58 feet.

Three miles southwest of production J. R. Bevill and associates' Alex Edmonds 1, NE NE 16-20n-5w, is drilling below 3351 feet.

United Gas Public Service Company continues to add to its block around Section 13-21n-5w. W. H. North has been active in leasing around Lisbon having taken several tracts in Section 11-20n-5w, and with Ray P. Oden leased SE NE 28-21n-5w, and North individually took NE SE 1-20n-5w. J. W. Love has leased NE NE 31-21n-4w, and Magnolia Petroleum Company leased W½ SE 7-21n-5w. Gulf Oil Corporation is leasing in 22-21n-4w, and in 14-21n- 4w.

A total of 116,063 barrels of Lisbon crude had been turned into pipe lines to May 15.

El Dorado, Ark.—Lion Oil Refining Company has bought all of the oil producing properties in Arkansas of Ohio Oil Company, except in the Stephens field, which was retained for its deeper producing possibilities.

ARKANSAS FIELDS

Second Schuler Well Flows

El Dorado, Ark.—The Schuler field, Union County, added its second oil well when Marine Oil Company's M. Justiss 1, SWc Lot 7, NW 18-18-17, was completed last week after casing was perforated at 5591 to 5601 feet, flowing 993 barrels of oil in 24 hours through ¾-inch tubing choke. Total depth was 5660 feet with 7-inch casing set on bottom. Elevation was 259 feet. It is a north offset to Lion Oil Refining Company's Edna Morgan 1 in the same section, the discovery well of the field.

Flowing for the first 13 hours through 1½-inch tubing choke, the well had the following hourly gauges: first hour, 92 barrels; second, 83; third, 71; fourth, 80; fifth, 68; sixth, 77; seventh, 69; eighth, 80; ninth, 61; tenth, eleventh and twelfth, 66; and thirteenth, 61. Changed then to a 1-inch tubing choke the well continued to flow 70 barrels

through that sized choke, with casing pressure of 600 pounds, no tubing presture being gauged. Separator pressure was 100 pounds and temperature 98 degrees.

Possibilities of a still deeper producing horizon at Schuler will be tested in Lion Oil Refining Company's Edna Morgan B-1, SW NW SE 18-18-17, which was reaming to bottom Thursday for a second attempt at a drill stem to test a showing of oil and gas in a sand under a shale section that appeared in a core from 5696 to 5702 feet. This test showed for a producer at the 5550-foot level of the two present producers in the field. Alice Sidney Oil Company's D. S. Morgan 1, same section, was coring at 5635 feet.

Six new locations were made in Schuler as a result of the completion of Marine Oil Company's M. Justiss 1, as a producer.

Plan Columbia test to 6000'

El Dorado, Ark.—On the strength of the developments at Shuler, Union County, a 6000-foot wildcat test will be drilled in Section 13-17-20, Columbia County, by W. G. Ray Drilling Company of Shreveport, who has agreed to deepen Magale & Elam's Garrett 1, abandoned at 4004 feet several months ago or drill another test to 6000 feet.

Around this block of acreage leases are held by Arkansas - Louisiana Gas Company, Lion Oil Refining Company, Magnolia Petroleum Company, Phillips Petroleum Company, and Shell Petroleum Corporation.

Frank Bryan who has been leasing in this county around Section 30-17-19, has begun turning the leases to Tide Water Associated Oil Company, J. F. Magale has assigned some of his leases around Section 17-20-21 to Farrell & Company of Fort Worth, Texas. Magale is also considering deepening Kendrick 1, Section 7-19-18, drilled by F. W. Burford to 5417 feet in the Travis Peak. L. A. Longino who has been leasing in Columbia County is assigning leases to Magnolia Petroleum Company. Texas Company is leasing in township 18, ranges 21 and 211, Columbia County.

Two Arkansas drilling permits

El Dorado, Ark.—Two drilling permits were authorized last week by the Arkansas Board of Conservation, as follows: Lonoke County—A. N. Demers, Jeff High 1, 330 feet south and west NEc SW SE 25-1n-9w; La Fayette County—Nivla Oil Corporation, DeLay 1, 330 feet north and east SWc NW SE 19-15-24.

ARKANSAS
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
CLARK COUNTY—		
Carter & Burdick, Ozan Lbr. Co. 1, 25-9-19	*	1525
MILLER COUNTY—		
E. H. Moore, Inc., Dale 3, 24-15-26	*	4270
NEVADA COUNTY—		
G. H. Vaughn, Cristopher 1, 3-14-20	*	4335
Bruce E. Wallace, Wm. Haynie 2, 6-14-20	10	1166
UNION COUNTY—		
Marine Oil Co., M. Justiss 1, 18-18-17	993	5660

*Failures; †Junked; ¶Million cu. ft. gas.

Lance Creek productive from new deep level.

* * *

Minnelusa strike will stimulate drilling.

Casper, Wyo.—Opening of a new producing horizon for the Lance Creek field, Niobrara County, topped the list of activities for the Rocky Mountain area. Completion early this week of Ohio Oil Company's Leo OPC-16 5, for an official gauge of 600 barrels per day through tubing choke from the lower Minnelusa (Tensleep) formation at 5,516-37 feet, marked the opening of that formation for commercial production in this field.

Crude from the Tensleep in the field registers 42 gravity and is paraffin base, dark green in color. The well had 21 feet of saturated sand and stopped in saturation. Leo 5 was originally started as a Sundance well, but encountered water in that sand at 4275-97 feet. It is ¾-mile east of the outpost producer from the Sundance horizon of the field, in NW NW SW 35-36n-65w, and constitutes an important extension as well as opening the lower producing formation.

Oil in the Minnelusa formation will stimulate another extensive drilling campaign at Lance Creek. Three offsets by the Continental Oil Company will be necessary. Ohio Oil Company has released location for two more deep tests to the Minnelusa, Leo 1-OPC-7, NWc NE SE 35-36n-65w, and Leo 2-OPC-7, NEc NE SE 35-36n-65w, which will cause the deepening of two old Continental Oil Company wells offsets to these locations. As the Minnelusa discovery carried water in the Sundance it gives the lower producing formation a considerable but undetermined larger area than the Sundance in the west end of the field, which embraces approximately 4500 acres. A strong leasing play is taking place in the area with edge acreage formerly considered as worthless and condemned in some instances by Sundance water wells, bringing bonuses ranging from $2 to $20 per acre.

Four and three-fourths miles east of the Leo well, the Continental Oil Company is spudding its Leach 1, CSW NE NE 29-26n-64w, on its block of 5000 acres covering the East Lance Creek area. Location was made following an extensive sub-surface mapping by the seismograph method the past summer.

Tri-State Area

In the Tri-State Basin area comprising the southwestern corner of Wyoming, the northeastern corner of Utah, and the northwest corner of Colorado, one new important test got underway this week. Italo Petroleum Corporation of California is drilling water well for Wanner-Government 1, SE NE 36-12n-98w. It is a northeast offset to Mountain Fuel Supply Company's J. C. Donnell 1, NE SE 31-19n-97w, Powder Wash field, and will mark an extension to the field recently proved for large commercial oil production in the sands of the Lower Wasatch formation, Tertiary Age. Donnell 1 is coring at 4877 feet in Lower Wasatch and feeling for oil sands. So far the test has encountered several gas shows but has failed to encounter oil in the upper horizons where the discovery well developed oil as well as in the basal Wasatch.

In the South Baxter Basin gas field, Sweetwater County, Wyoming, Mountain Fuel Supply Company's Union Pacific 3, SE NE 15-16n-104w, is a near completion, testing gas production in the Frontier from 2246 to 2270 feet.

In Moffat County, Colorado, Anderson-Kerr Drilling Company's Gail Mars 1, CSE NE 17-11n-100w, Shell Creek structure, is moving in rotary equipment. Anderson-Kerr and Phillips Petroleum Corporation's Government 1, CSE SE 19-9n-99w, Dry Mountain structure, is drilling at 2285 in brown sandy shale. The 10-inch casing has been set at 2250 feet for formation shutoff.

MOUNTAIN STATES
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
MONTANA		
GLACIER COUNTY (Cut Bank)—		
C. E. Walgren, Britton 2, se ne 14-34n-6w	*	2915
TOOLE COUNTY (Kevin-Sunburst)—		
Big West Oil Co., Dahlquist 7, nw ne 21-35n-3w	17	1837
Consolidated Gas Co., Fee 5, se nw 29-35n-3w	12	1512
A. E. Crumley, Jarret 7, se ne 29-35-2w	8	1478
Nepstead & VanDerpas, Solberg 2, csw ne 29-35n-3w	10	1780
Aaron Welch, Larum 1, sw sw nw 25-36n-3w	20	1802
WYOMING		
NIOBRARA COUNTY (Lance Creek)—		
Ohio Oil Co., Richards & Comstock 2, ne sw 32-36n-65w	480	3783
CARBON COUNTY (Medicine Bow)—		
Ohio Oil Co., Wm. Kyle 2, cse se 26-21n-79w	3240	5668
WESTON COUNTY (Osage)—		
Chas. Stough 8, csl sw nw 4-46n-63w	2	300

*Failures; †Junked; ¶Million cu. ft. gas.

Prolific wells on edge of Monument structure.

* * *

Lea County drilling operations continue gain.

Hobbs.—The prolific flow developed by east and northeast edge wells on the Monument structure afforded important developments the past week. Continental Oil Company's State 4, C NE SW 17-19s-37e, will require three offsets in showing for one of the largest wells in the northeast section by flowing 147 barrels per hour through casing with the drill pipe in the hole when tested at 4004 feet. Pressure control equipment will be employed in removing the drill pipe and to run tubing for completion without killing the production.

The east flank of the field, which is uniformly outlined by production in a north and south direction, contributed its largest producer when Skelly Oil Company's No. 6 on the C SW SE 9-20s-37e, flowed an average of 173 barrels oil per hour for 4 hours natural through open tubing, and gauged 190 barrels the last hour. This well was drilled to 3881 feet, or 326 feet sub-sea, and is a safe distance above the water level. Volume of gas was rated at 1,250,000 feet daily.

Allowable Increased

Allowable production for New Mexico fields was advanced only 500 barrels when the June schedule was prepared by the oil conservation commission. Increases ranging from 3200 barrels to 7600 barrels were put into effect at the start of each month since the first of the year. The June schedule gives the state an output of 114,500 barrels daily, and the boost was not sufficient to offset the production earned by new completions. Lea County areas prorated on a flat allowable basis were cut from 89 barrels to 87 barrels per well daily.

Lea County was credited with 16 new operations the past week, and recorded 11 oil producers and a junked hole. Eight areas share in the new field work, including the Vacuum pool, where Magnolia Petroleum Company has started work on State-Briges 2, C SW SE 14-17s-34e, about ½ mile southwest of its discovery. The company holds lease on 5281 acres and will attempt to build up sufficient production to attract a pipe line connection. This is the only pool in the county of any consequence that is without a market for the production.

Resumption of development on the north end of Cooper field has been undertaken by Continental Oil Company et al with the starting of operations on Stevens 1-A-34, C SW NW 34-23s-36e.

Illinois Oil Company's Seth Alston-Conoco 1, wildcat on a federal permit and about 5½ miles northwest of the Hobbs field, encountered 500 feet of sulphur water from lime at 4745-90 feet, with an elevation of 3775 feet, and was drilling in lime at 4870 feet.

Magnolia Petroleum Company's Hanna 1, C SE NE 7-26s-38e, wildcat near the southeast corner of the county, logged top of brown lime at 2830 feet, with an elevation of 3024 feet, and was drilling below 2900 feet with cable tools. It is credited with being structurally higher than a 4115-foot failure, located about 1¾ miles west by south. The latter passed up free oil in the hole at 3450-55 feet.

Sandy Lime Trend Active

The sandy lime production trend up the east portion of Lea County continues to gain in drilling operations. In the Hardy area, north of Eunice townsite, Magnolia Petroleum Company, General Crude Oil Company and R. R. Penn estate have started operations on C. Hardy 1, SW SW NW 29-21s-37e, and Ohio Oil Company has made location for Tuenre 2, SW NW SE 29-21s-37e.

New operations in the Penrose field include Gulf Oil Corporation's Manda 1, C SW SW 21-22s-37e, and W. H. Street et al's Wood 2, C SW NE 22-22s-37e, Skelly Oil Company's Sims 1-C, C SE SW 3-23s-37e, lost hole at 3388 feet, and has skidded rig.

In the Mattix area, Repollo Oil Company has awarded contract for Robert Jamison 3, SW NE NE 21-24s-37e, and Western Gas Company's W. H. Harrison 3, C NW SW 20-24s-37e, is an outpost location.

Closing Gap

Closing of the gap between the Eunice and Monument fields advanced one location nearer when The Texas Company's State-Lieu 8, NE SE NE 20-20s-37e, flowed 46 barrels per hour through ⅞-inch choke after using 2000 gallons of acid at 3830-3856 feet. It is bottomed at 330 feet sub-sea, and is a west offset to a producer that had to be drilled to 344 feet below sea level to make a flowing well. The latter was the southernmost producer for the Monument field. Continental Oil Company et al's Sanderson 5-A11, NE SE SW 11-20s-36e, southwest edge producer, flowed 295 barrels oil in 18 hours through 13/64-inch choke after drilling to 3880 feet.

Amerada Petroleum Corporation's State 4-D, C NE NW 1-20s-36e, east offset to the company's discovery well of the Monument area, flowed 83 barrels per hour natural through one-inch choke, with the hole bottomed at 3900 feet. Gas-oil ratio was 406/1. The company has 97 flowing wells, prorated to 8313 barrels daily, on its discovery block.

The only location announced for the Monument field was The Texas Company's State-Lieu 11, C NW NW 20-20s-37e. Hobbs field also reported a single location, and it was Stanolind Oil & Gas Company's Terry 8, C NW SE 9-19s-38e. Five new locations assigned the Eunice field are on the east and west edges of production. Continental Oil Company et al started work on Lockhart 1-B-30, C SE SW 30-21s-36e, and Lockhart 5-A-30, NE NE SW 30-31s-36e, both on the west flank. Shell Petroleum Corporation's State 4-M, Lot 16, 1-21s-35e, is on the west edge, and Stanolind Oil & Gas Company's McQuatters 2, C NW NE 11-21s-36e, is in the extreme east portion.

NEW MEXICO
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
LEA COUNTY (Eunice)—		
Phillips Pet. Co., State-Quapaw 1, c se se 19-20s-37e	138	3864
Shell, State 4-K, c nw ne 36-20s-36e	1500	3854
LEA COUNTY (Mattix)—		
Stanolind, C. Myers 4, c se sw 22-24s-37e	500	3565
LEA COUNTY (Monument)—		
Amerada, State 4-D, c ne nw 1-20s-36e	4000	3900
Continental et al, H. M. Britt 4-B-18, c ne se 18-20s-37e	400	3866
Sanderson 5-A-11, ne se sw 11-20s-36e	1500	3880
Gulf Oil Corp., State-Kutter 1-C, c se ne 18-19s-37e	600	4026
Skelly Oil Co., Van Etten 6, c sw se 9-20s-37e	6000	3881
The Texas Co., State-Lieu 8, ne se ne 20-20s-37e	2500	3856
LEA COUNTY (Penrose)—		
Ohio Oil Co., J. W. Grizzell 1, c sw se 5-22s-37e	500	3740
Stanolind, Eva Owens 1, c sw nw 3-22s-37e	400	3725
LEA COUNTY (Skelly)—		
Skelly Oil Co., Sims 1-C, c se sw 3-23s-37e	†	3388

*Failures; †Junked; ¶Million cu. ft. gas.

Texas Permits Down 143

Austin.—The Texas Railroad Commission approved last week permits for drilling 319 new wells in Texas, 143 less than were allowed the week before.

In the East Texas field there were 83 new locations, including 39 in Gregg County, 28 in Rusk County, 16 in Upshur County, and 10 in Smith County. East Central Texas reported 32 locations, 13 being in Shelby County.

West Texas reported 50 permits, with 12 in Ector and 11 in Winkler County. Panhandle area reported eight permits.

There were 36 locations from North Texas district, all scattered. West Central Texas listed 19 locations.

There were 55 permits for wells in the Gulf Coast district, including 14 in Brazoria County. Southwest Texas reported 36 permits.

CALIFORNIA FIELDS

Wilmington busiest in state with 90 operations.

* * *

Ten Sections test junked before making record.

* * *

Cantua Creek section to get more drilling.

Los Angeles.—With the new Wilmington field in the general Long Beach and Wilmington area being extended slowly in three directions each week, it has become the busiest area in California, though still without a proper pipe line outlet. It is possible the productive zone may extend out into the bay or harbor area.

According to last scout reports, there are now 90 operations in the new field, ranging from drilling wells to locations. There were 35 actively drilling wells, 33 rigs, 7 foundations, 4 rigging up operations and 11 locations. There are 110 producing wells in the field and the daily average production is running slightly in excess of 46,000 barrels.

The drilling is very easy. Completions depths range from about 3500 feet to close to 4000 feet. The wells are being completed with large holes. Around 2600 feet, operators are using 10¾-inch and 11¾-inch casing, and last casing is 8⅝-inch, as a usual procedure. The gravity of the oil ranges from 17 to 25.5. The sulphur content is rather high, in many instances too high to find a ready market unless it is mixed with a very low sulphur content oil.

No Pipe Line Outlet

The major pipe lines are slow to agree to establish pipe line connections, and a gathering line system. They are asking the smaller operators to reduce production. The operators are rather slow in reaching such agreements. But it is doubted if a pipe line company will agree to give service until some such agreement is reached.

The major pipe line companies also fear the real demand for larger pipe line service will drop to a minimum within the next three months, and they hesitate to make the necessary expenditures. Most students of the Wilmington situation are of the opinion that active drilling operations will drop to a very low ebb within 90 days.

Two Forced Into Play

One rather interesting thing in Wilmington field is that Union Pacific Railway Company has been forced into the oil business. Union Pacific fell heir to a number of small tracts of land, which forced the company into drilling a large number of offsets. At last report the company had 22 operations, ranging from locations to drilling wells. Each operation is a direct offset.

Another rather unusual and spectacular situation at Wilmington is the forcing of Henry Ford into the oil business, for the first time in his business history. He has a large assembling plant almost in the center of the best part of the Wilmington field. Ford Motor Company closed a deal for the General Petroleum Corporation to develop the Ford tract. General Petroleum Corporation completed several wells on the property and has six new operations in progress. There are known to be at least three productive zones on this property.

Deep Test Quits

California fell just 168 feet short of equaling the world record for depth for a wildcat test when Superior Oil Company and Union Oil Company's Kern County Land Company 8 in the Ten Section area stuck the drill pipe with bottom of hole at 12,618 feet. All of the drill pipe except about 1000 feet on bottom was removed.

It is further understood no formation of real interest was found below 11,000 feet. But regardless of the failure, the hole was the deepest ever drilled in California. Last casing cemented was 7-inch at 10,380 feet. Five boilers were in place and three mud screens were in place for use as needed. The heaviest equipment usually used was at hand. Apparently nothing was left undone to make it possible to reach extreme depth without any serious trouble if it could be prevented by taking before hand precautions.

Cores were taken constantly and those cores were carefully checked. In fact, the hole has furnished some very valuable geological information, which has not been made public.

In the Cantua Creek area in Fresno County, Pure Oil Company has leased several thousand acres and it is understood the company plans to start a new well in the next 30 days. In this area, Western Gulf Oil Company recently drilled a wildcat to 8531 feet and produced some 35.8 gravity oil and a lot of water before being abandoned. It is understood the company will start a new hole in the next few weeks in this area.

CALIFORNIA Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
FRUITVALE—		
Pal Pen Oil Co., No. 2	175	3193
KERN FRONT—		
Apex Pet. Corp., No. 10-2	115	2193
MIDWAY SUNSET—		
Standard Oil Co., No. 48-33d	250	2880
ROUND MOUNTAIN—		
Shell Oil Co., Olcese 1-11	950	1910
LOMPOC—		
York Oil Co., Purisima A-3	20	1260
ADAM—		
Union Oil Co., Enos 3-23	90	3638
VENTURA AVENUE—		
Tide Water Associated, Lloyd 64	140	7080
Lloyd 66	350	5110
TULARE COUNTY—		
Trico Oil & Gas Co., Valley 1	*	4337
KERN COUNTY—		
Western Mesa Oil Co., Combine 1	*	1726
FRESNO COUNTY—		
Western Gulf Oil Co., So. Pac. Land 3	*	8531
SAN LUIS OBISPO COUNTY—		
Barnsdall Oil Co., K. C. L. A-1	*	5220
MONTEREY COUNTY—		
Shell Oil Co., Branch 2	*	8662
WEST COYOTE—		
Hogan Pet. Co., McNally 1	*	6231
INGLEWOOD—		
Standard Oil Co., L. A. Inv. 83	640	3655
WILMINGTON—		
General Pet. Corp., Ford 7	1600	3959
Ford 8	1950	3761
Holly Dev. Co., Dominguez 1	450	3576
Interstate Inv. Co., Kibbe 1	150	3740
G. Vallejo Leal, Vallego 1	180	3492
Olympic Ref. Co.'s Fee 3	150	3525
Ring Oil Co., Wilmington 3	850	3610
Sonwell Oil Co., Sonwell 1	700	3625
Union Pacific Ry. Co., Offset 6	830	3535
Royalty Service Corp., Comm. 7	550	3640

*Failures; †Junked; ¶Million cu. ft. gas.

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of
PETROLEUM GEOLOGISTS
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By
DAISY WINIFRED HEATH

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THE AMERICAN ASSOCIATION
OF PETROLEUM GEOLOGISTS
Box 1852
Tulsa, Oklahoma, U.S.A.

EASTERN FIELDS

2500-barrel Illinois well's production holding up.

* * *

Leasing hot following showing of Coal Basin wells.

Pittsburgh, Pa.—Pure Oil Company's Bunny Travis 1, which hit the producing McCloskey sand at 2960 feet a week ago, is maintaining steady production of 2500 barrels a day, breaking all records for the Illinois Coal Basin field. Location is SW NW Section 33-3n-8e, Clay Township of Clay County. The 41 gravity crude is flowing through a 1½-inch choke and is pushed by an estimated 1,400,000 cubic feet of gas. Thirty tank cars have been put into service to transport the crude to Indian Refining Company's plant at Lawrenceville, and the five-car loading rack at Clay City is being doubled.

Location of the Travis well is not far from Pure Oil Company's Eugene Weiler 1, SE SW SE Section 33-3n-8e, same township, which created a sensation in this area when brought in as a 100-barrel producer from Cypress sandstone of the Chester series, Upper Mississippian. Company officials are planning to deepen the Weiler well, now bottomed at 2613 feet. Drilling an offset 600 feet west of the Travis well on the Sarah M. Bechtel farm was started by Pure Oil Compay last week.

Leasing Feverish

Leasing activity in Clay and other counties comprising the Basin field continues at a feverish pace, and the area will see much play this summer. Wiser Oil Company leased the 780-acre Damon Smith farm, a short distance north and east of the Travis well, and will move a drilling rig in immediately.

The week saw a large number of completions in Eastern Fields, but few of an outstanding nature. The 24 producers included 200 and 100-barrel wells in Kentucky and a 125-barrel well in Ohio, while one good and three fair gas wells were completed in the Oriskany deep sand gas field of Kanawha County, West Virginia. Gas well completions totaled 30 and failures 12.

Largest Kentucky producer was No. 17 of W. E. Hupp and others on the Hackett Brothers tract, the Hardin pool of McLean and Ohio counties. It had initial production of 200 barrels daily from the Jet sand and was completed at 1146 feet.

A 100-barrel producer was completed by Petroleum Exploration Company as G. W. Gourley 14, Ida May District, Lee County.

Supplementing the 200-barrel well of W. E. Hupp and others in McLean County, Cumberland Petroleum Company has a 25-barrel producer in Elmer Nall 7, Knobs district, which was drilled to 1643 feet, but plugged back to 1563, the bottom of the Barlow sand, and Major Oil Company has a 15-barrel well in Clifton Mack 1, on a Livermore city lot. C. J. Sipple & Company's 5-barrel producer, James Love 20, Wheelersburg District, Magoffin County, and J. C. Ellis and others' failure with James Heifner 2, Heflin district, Ohio County, complete the Kentucky picture for the week.

Edward H. Everett Company has a 125-barrel producer in Ella C. Gill 2, Licking Township, Muskingum County, which was completed in the Clinton sand at 2971 feet. It was the best of the 29 Ohio completions—eight others being small producers, 11 gas wells and nine failures.

30 Rigs Running at Oriskany

In the Oriskany deep sand gas field of Kanawha County, West Virginia, the Glenn Oil and Gas Company completed its second test on the Virginia Joint Stock Land Bank, Elk District, at 5060 feet. The sand was topped at 5114 feet and the well gauged 11,000,000 cubic feet. Three smaller wells were also completed in this field. Approximately 30 wells are currently drilling in Oriskany, with rigs building for five others.

Salt water encountered at 4185 feet on the test of G. L. Cabot, Inc., on the T. H. Wing farm, Greenwood Township, Steuben County, on the New York side of the Pennsylvania-New York deep sand gas field, rose 1200 feet in the hole and caused abandonment of the test at 4193 feet. It topped the Oriskany sand at 4179 feet. Operators in this field are watching the test of Atwater et al on the Herrington farm, Woodull Township, same county, which encountered the Oriskany at 3955 feet. Now running pipe, gas gauged 75,000 cubic feet per day when the test was drilled one foot into the sand. It is distant from any present defined production in this area, being northwest of the Tioga field and northeast of the Harrison field.

Operations are increasing in the Allegany County field, New York, where 46 wells are currently drilling. Sloan and Zook interests, operating as the Sloan and Zook Company and the Bradford Producing Corporation, lead the field's operations with 10 active wells.

EASTERN FIELDS
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
OHIO		
ATHENS COUNTY—		
A. D. Townsend et al, Jacob Niggemeyer 2	¶1	1694
AUGLAIZE COUNTY—		
Buckland Oil Corp., S. V. Scott 5	*	1217
HOCKING COUNTY—		
Preston Oil Co., Sunday Creek Coal Co. 1637	*	3485
Ohio Fuel Gas Co., Sunday Creek Coal Co. 150	¶	933
Moffat, Adam Schaal 2	*	....
JEFFERSON COUNTY—		
J. D. Jackson et al, J. T. Williamson 2	1½	1492
KNOX COUNTY—		
Upham Gas Co., Warren Farmer 4	*	2910
LICKING COUNTY—		
Emerald Petroleum Co. et al, Charles Cullison 2	*	3075
Etrucker & Armbuster, G. E. Patton 8	4	756
T. W. Locknett et al, T. R. Vanallen 2	¶	705
Preston Oil Co., James C. Wright 14	1	703
LORAIN COUNTY—		
The Kemrow Co., M. J. Osborne 1	*	2708
Ohio Fuel Gas Co., Evelyn Buner 1	¶	2580
MEDINA COUNTY—		
E. R. Edson & Son Co., Ray & Cora Koons 6	*	566
MONROE COUNTY—		
Lumbatis & Co., Olive Fogle 2	¶	966
Bentz Syndicate Oil Co., B. F. Cline 4	*	1555
MORGAN COUNTY—		
Sands & Co., Martha Glass 34	2	160
Martha Glass 35	2	170
Wildwood Oil & Gas Co., C. E. Nelson 1	¶	1355
MUSKINGUM COUNTY—		
Edward H. Everett Co. et al, Ella C. Gill 2	125	2971

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Company, Well and Location	Init. Prod. Bbls.	Depth
SENECA COUNTY—		
Charles Zeising, Laura Wright 1..	¶	1207
J. R. Summers, J. Summers 1	1	1200
STARK COUNTY—		
East Ohio Gas Co., C. H. Rudy 2	¶1	4266
SUMMIT COUNTY—		
East Ohio Gas Co., C. E. McCafferty 1	¶1 1/3	4245
Charles Hartong 32	¶¾	4172
WASHINGTON COUNTY—		
O. K. Parrett, A. A. Goodard.....	4	624
Dupuy Bros., H. W. Winland 4...	¶¼	1372
Hall & Henning Co., J. W. Pryor 4	*	1660
WAYNE COUNTY—		
Preston Oil Co., J. W. Scholl.....	5	3297

WEST VIRGINIA

CABEL COUNTY—		
West Virginia Gas Co., J. J. Porter Heirs 1	¶ 1/3	3412
CALHOUN COUNTY—		
Ritchter Oil Co., J. L. Elliott Heirs 3	4	1786
Jeff Miller et al, Bert Wears 1....¶1	2/3	2206
Hope Natural Gas Co., Clay McDonald 7768	¶	2123
CLAY COUNTY—		
Harry M. Boggs, H. M. Boggs 1..	¶	1015
FAYETTE COUNTY—		
Godfrey L. Cabot, Inc., Kanawha Gauley Coal Co. 9	¶	2775
KANAWHA COUNTY—		
Glenn Oil & Gas Co., Virginia Joint Stock Land Bank 2	¶11	5060
Columbian Carbon Co., B. R. Reed	¶6	5083
Benedum & Trees, T. W. Walls 1..¶5¼		4899
Columbian Carbon Co., W. L. Burdette 2 .....¶2¾		4929
LINCOLN COUNTY—		
United Fuel Gas Co., Robert Linville 4713	¶	3853
MARION COUNTY—		
Victor E. Tennant, Price Heirs 1..	3	2876
MARSHALL COUNTY—		
Manufacturers Light & Heat Co., D. L. McGinnis .....¶1½		1946
RITCHIE COUNTY—		
McBurney et al, M. B. Nutter 3..	15	1615
Frymier & Co., Geo. W. Hammer 5	2	2082
Mahone et al, Thomas Murray.....	¶	1730
S. P. Y. Oil Co., W. B. & Cora Phillips	¶	2029
ROANE COUNTY—		
L. C. Young et al, Kee & Lawson 1 .....¶3½		1488
TYLER COUNTY—		
W. H. Miller, Kate Headley 1.....	2	1785
WETZEL COUNTY—		
C. B. Lewis et al, Veronica Doppler 1	¶3	....

PENNSYLVANIA

GREENE COUNTY—		
Natural Gas Co. of W. Va., J. S. Johnson 1	¶	2849
Dunn Marr Oil & Gas Co., J. T. Heirs 2	1	3360
WASHINGTON COUNTY—		
Union Gasoline & Oil Corp., A. O. VanKirk 1	30	3112
Dunn Marr Oil & Gas Co., J. T. Baldwin 2	4	3018
Dempsey Oil Co., John Seabright 1.¶¼		2150

KENTUCKY

FLOYD COUNTY—		
Warfield Natural Gas Co., Maudie Clark 4723	¶	2795
G. W. Mayo 4722	¶	2390
HANCOCK COUNTY—		
Cumberland Petroleum Co., Joe Powers 2	*	585
LAWRENCE COUNTY—		
Kentucky Oil Producers Co., Mort Mullins 6	3	821
LEE COUNTY—		
Petroleum Exploration Co., G. W. Gourley 14	100	....
McLEAN COUNTY—		
W. E. Hupp et al, Hackett Bros. 17	200	1146
Cumberland Petroleum Co., Elmer Nall 7	25	1643
Major Oil Co., Clifton Mack 1....	15	....
MAGOFFIN CONUTY—		
C. J. Sipple & Co., James Love 20..	5	950
OHIO COUNTY—		
J. C. Ellis et al, James Heifner 2..	*	1110

ILLINOIS

CLAY COUNTY—		
Pure Oil Co., B. Travis 1 2500		2960

NEW YORK

STEUBEN COUNTY—		
G. L. Cabot, Inc., T. H. Wing 1..	*	4193

*Failures; †Junked; ¶Million cu. ft. gas.

MICHIGAN FIELDS

State feeling effects of Buckeye area proration

Mt. Pleasant Mich.—Stringent proration in the new Buckeye area of Gladwin County has started to make itself felt not only in the new field but in general over the state. Much of the feverish activity in evidence 30 days past has subsided.

There are approximately 270 active locations in Michigan, of which 115 are in Buckeye Township. Of the later number approximately 85 were drilling this week.

Potential production of the pool, according to the Buckeye operators' committee is close to 70,000 barrels daily, against actual pipe line takes of less than 20,000 barrels. The effect of proration in the field is spreading into other areas and in several instances has forestalled immediate development plans on other than necessary offsets.

McClanahan May Enter Field

Reliable sources this week reported that McClanahan Pipe Line Company plans to enter the field now served only by Pure and Simrall pipe line systems.

A trend toward wildcat testing in northern Michigan counties is evidenced this summer with a number of tests active in far north areas. Several big blocks of acreage have been taken, mostly by independents.

With the exception of the new Allegan County play on the west side of the state, wildcatting has not been profitable since the first of the year. The Allegan play in Salem Township is shallow Traverse production and, while important to that immediate vicinity, so far has not indicated a reserve of state-wide importance.

MICHIGAN

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
ALLEGAN COUNTY—		
Muskegon Oil Corp.'s Moomey 2, nw ne se 17-4n-13w	100	1616
GLADWIN COUNTY—		
Mammoth Prod. & Ref.'s State C 1, ne se se 10-18n-1w	165	3640
Sun Oil Co.'s Salla 6, nw sw sw 11-18n-1w	360	3629
Garfield Pet. Co.'s Fee 2, nw sw ne 14-18n-1w	410	3639
Mich. Prod. & Ref.'s Frances 2, se nw nw 14-18n-1w	450	3636
Rex Oil Co.'s Hall 2, ne ne ne 35-18n-1w	685	3592
Clark & Johnson's McMahon 2, nw ne sw 36-18n-1w	600	3580
Sun Oil Co.'s Hines 2, nw sw nw 31-17n-1w	30	3896
ISABELLA COUNTY—		
Pure Oil Co.'s Latham 1, ne se se 32-15n-6w	270	3650
Latham 3, n½ se se 33-15n-6w...	410	3678
McClanahan Oil Co.'s Embrey 1, sw se se 33-15n-6w	150	3641
MIDLAND COUNTY—		
Pure Oil Co.'s Bond C 8, n½ se nw 12-13n-2w	110	3548
MONTCALM COUNTY—		
Wolverine Gas Co.'s Forgar 1, c 12-11-12, 12n-7w	¶6	1262
Richard Hall's Flint 1, se sw ne 35-11n-5w	*	3220
GRATIOT COUNTY—		
A. N. Palmeter's Bliss 1, ne nw ne 18-9n-1w	*	2960
OGEMAW COUNTY—		
Ross & Bernier's Izworski 3, se ne ne 23-22n-1e	300	2851

*Failures; †Junked; ¶Million cu. ft. gas.

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IMPORTANT WILDCAT TESTS

ABBREVIATIONS

The following abbreviations, signs, etc., are used in completions and wildcat reports in THE OIL WEEKLY.

*—*dry hole abandoned well.*
‡—*salt water (completions).*
†—*junked and abandoned.*
¶—*million feet of gas.*
abd—*abandoned.*
bbls—*barrels.*
br—*building rig.*
b.s.—*basic sediment.*
csg—*casing.*
co—*cleaning out.*
dd—*drilling deeper.*
dk—*derrick.*
dr—*drilling.*
fsg—*fishing.*
ft—*feet.*
hfw—*hole full of water.*
in—*inches.*
lcn—*location.*
m—*milling.*
mim—*moving in materials.*
mit—*moving in tools.*
mot—*milling on tools.*
n, s, e, w—*north, south, east, west.*
oih—*oil in hole.*
owdd—*old well drilling deeper.*
owpb—*old well plugging back.*
pb—*plugged back or plugging back.*
r—*reaming.*
rog—*rig on the ground.*
rur—*rigging up rotary tools.*
rust—*rigging up standard tools.*
sd—*shut down.*
sdtr—*sidetracking.*
sg—*show gas.*
si—*shut in.*
so—*show oil.*
so&g—*show oil and gas.*
spd—*spudding.*
sr—*straight reaming.*
sw—*salt water.*
td—*total depth.*
ur—*underreaming.*
wih—*water in the hole.*
wo—*workover.*
wocs—*waiting on cement to set.*
wosr—*waiting on standard rig.*

ARKANSAS

ASHLEY COUNTY—Joe Modisett & Phillips' Stillions 1, s½ sw nw 18-17-9, rog.

CLARK COUNTY — McLarry & Carlin's Bierne 1, ne se ne 22-10s-21w, sd 103 ft. Carter & Burdick's Ozan 1, ne nw 25-9-19, dry abn, td 1525 ft. M. W. Martin's Cabe 1, nw nw 14-10-20, install heavier rig 1002 ft.

CLEVELAND COUNTY — Texas-Canadian Dev. Co., Inc.'s I. E. Moore Est. 1, ne ne 22-9-10, rur.

COLUMBIA COUNTY—Robt. Keen's Runyon 1, 1-16-21, dk.

DALLAS COUNTY—J. C. Voyles et al's Sorrells 1, se se sw 35-10-16, dr 280 ft.

HEMPSTEAD COUNTY—Easton, May & Murdock's LaGrone 1, ne ne 5-12-26, spd. E. H. Moore, Inc.'s Porterfield 1, ne se 21-14-25, elev 346 ft, chalk 1275-1650 ft, top anhydrite 3128 ft, dr 3350 ft.

HOWARD COUNTY—Boetcher O&G Co.'s State Life 1, nw nw 28-11-27, mim.

LA FAYETTE COUNTY—Nivla Oil Corp.'s (formerly carried E. H. Moore, Inc.), DeLay 1, nw sw se 19-15-24, spd.

LINCOLN COUNTY—Fitzwater et al's V. Bowens 1, nw sw ne 26-9-6, rur.

LITTLE RIVER COUNTY—J. G. Strahan's Dierks 1, 21-12-28, top red beds 1130 ft, top anhydrite 1804 ft, so 2349-54 ft, arr test, td 2354 ft.

MILLER COUNTY—W. L. McClanahan et al's Capps 1, ne sw 11-20-28, elev 284 ft, chalk 2040-2552 ft, top first anhydrite 5270 ft, dr 5610 ft. E. H. Moore, Inc.'s Dale 2, c e½ 24-15-26, elev 250 ft, top Young 4320 ft, top Petitt 4534 ft, top Travis Peak 4654 ft, dr 5380 ft, red shale. Standard's Harvey 1, sw sw sw 33-16-26, rur (9000 ft test).

NEVADA COUNTY — Benedum & Trees' Grove 1, se nw 10-14-20, tested 2100 ft sw in 2 hours 4277-4317 ft, dr 4750 ft shale and lime. Bruce Wallace's Haynie 3, se nw 6-14-20, 10-in csg 105 ft.

OUACHITA COUNTY — Copenhaver Oil Corp.'s J. E. Evans 1, nw ne sw 20-11-19, rur. H. H. Taylor's Joe McCree 1, dr 2705 ft gravel.

UNION COUNTY — Alice Sidney Oil Co.'s Morgan 1, 18-18-17, arr make test, td 5603 ft; Morgan 2 & 3, 18-18-17, lcns; Powledge 1, sw se 7-18-17, lcn. Lion's Edna Morgan B-1, 18-18-17, testing, td 5655 ft; Edna Morgan B-2, 18-18-17, lcn. Marine Oil Co.'s M. Justiss 1, 18-18-17, gauged 993 bbls oil in 24 hrs through ¾-in choke, td 5600 ft; M. Justiss 2, sw se ne 18-18-17, mim. Edwin M. Jones' Murphy Land Co. 1, ne ne 18-18-17, lcn. W. D. Wingfield's Southern Kraft Corp. 1, 18-16-14, elev 124 ft, tested 5 joints drill fluid 10 minutes 2333-50 ft, tested 16 thribbles sw in 15 minutes 2476-82 ft, top Blossom 2619 ft, coring 2643 ft.

CALIFORNIA

FRESNO COUNTY

CANTUA CREEK—Western Gulf Oil Co's So. Pacific Land Co. 3, 3-17-15, td 8531, plug 6950 ft, abn after frequent swabbing tests showing 200 to 300 bbls of about 35.8 gravity oil and considerable water. Probably will make location for No. 4. Company has some 36,000 acres under lease in this general area.

KERN COUNTY

DEVIL'S DEN—Amerada Pet. Co's Beer 4, 17-26-19, dr shale 874 ft. Den Pet. Co.'s Bates 1, 20-25-19, dr shale streaks oil sand 4260 ft. Geo. Goodrum's Baron 1, 24-25-18, sd 320 ft.

LERDO—Arkelo Pet. Co.'s No 41, 23-28-26, td 10,056 ft, fsh dr pipe.

BENA—Bacal Oil Corp.'s No. 1, 5-30-30, rur. Cajalco Pet. Co.'s No. 1, 9-30-30, dr shale 1975 ft.

ROUND MOUNTAIN — California Western Oil Co.'s No. 1, 4-28-29, rur.

PREMIER—Bojaki Oil Co.'s Bowen 1, 28-27-27, sd 1959 ft. General Pet. Corp.'s No. 1, 36-27-26,lcn.

GRAPEVINE—Buffalo Oil Co.'s Tejon 1, 5-10-19, sd 4452 ft. Ohio Oil Co.'s Title Ins. D1, 21-11-19, dr shale 8674 ft. Reserve Oil & Gas Co.'s Ritchie 33-1, 33-11-19, td 6030 ft, plug 4990 ft, sd; Tejon 33-2, td 4505 ft, redr to 4476 ft, sd; No. 33-2, td 4431 ft, gas well, shut in; No. 33-4, dr shale 4475 ft.

KERN FRONT—C. C. M. Oil Co.'s Carter 1, 7-27-27, dr hard blue shale, 2277 ft.

WASCO—Continental Oil Co.'s K.C.L. A-1, 8-27-24, td 9591 ft, sd; No. 2, rig. Seaboard Oil Corp.-Tide Water Associated's K. C. L. C-1, 26-27-24, td 9159 ft in shale, showing oil, r, to run 7-inch to bottom.

JASMINE—Doyle Pet. Co.'s Quinn 1, 15-25-27, td 2956 ft, plug 2882 ft, bailing and co.

ROSEDALE—Continental Oil Co.'s K.C.L. B-1, 12-29-26, dr shale 8592 ft.

EDISON—East Edison Oil Co.'s No. 1, 23-30-30, sd in granite 1150 ft.

ELK HILLS—Elk Hill Pet. Co.'s No. 1, 14-31-28, td 7580 ft, sd in gray shale.

CARRIZO PLAINS—Eocene Oil Co.'s No. 1, 31-31-22, lcn.

ARVIN—General Petroleum Corp.'s No. 1, 26-31-29, td 7462 ft, plug 7215 ft, pumping 60 bbls 32.8 gravity oil cut 35 per cent.

NORTH KERN RIVER—Hub Oil Co.'s No. 1, 8-28-28, dr shale 3400 ft.

ROUND MOUNTAIN—Patton-Baldwin Oil Co.'s No. 1, 32-28-29, rig.

KERN FRONT—Seskayden Oil Co.'s No. 3A, 17-28-27, sd 2890 ft.

TEN SECTION—Shell Oil Co.'s Canal 21-14, 14-30-25, dr shale 88263 ft. Superior Oil o.-Union Oil Co.'s K.C.L. 8, 11-30-26, dr shale below 12,590 ft.

STRAND—Ohio Oil Co.'s K.C.L. E2, 6-30-26, dr sandy shale 6408 ft.

FRUITVALE—Shell Oil Co.'s K.C.L. A-36, lcn.

WEST MOUNTAIN VIEW—Sunset Oil Co.'s Sunset-Starr 1, 17-30-28, dr shale 6110 ft.

McGUNDEN—Superior Oil Co.-Union Oil Co.'s Crome Com. 2, 36-29-28, bldg rig.

SOUTH MARICOPA — Trans-Line Pet. Corp.'s No. 1, 3-10-23, sd 662 ft.

SAN EMIDIO—Union Oil Co.'s No. C-3, 33-11-22, dr shale 2890 ft.

RIO BRAVO—Union Oil Co.'s Kernco 1-34, 34-28-25, dr brown shale 8375 ft.

MIDWAY-SUNSET—Valley Oil Co.'s No. 1, 18-32-23, dr sandy shale 3110 ft.

BAKERSFIELD—Wilshire Co.'s F & P 1, 36-29-27, dr shale 4001 ft.

MISCELLANEOUS

HUMBOLDT COUNTY—Texas Co.'s Eureka 2, 22-3-1, td 7708 ft, hole caving, lost bit, fsh.

KINGS COUNTY—Birch-Royer Oil Co.'s Wm. Orr 1, 5-23-17, rigged and sd. Central Calif. Utilities Corp.'s Kettleman-Lakeview 1, 11-23-19, sd 1202 ft. Dudley Ridge Oil Co.'s No. 2, 24-23-20, dr shale 310 ft. Kettleman View Oil & Gas Co.'s No. 1, 9-22-19 sd 4787 ft. Glen C. Stone's Teeter 1, 25-20-20, sd 1040 ft. Tri-Counties Oil Co.'s Olson 1, 10-23-22, td 4300 ft, wocs 7 in at 4300 ft.

SAN BENITO COUNTY—Tide Water Associated's Murphy Ranch 1, 5-12-4, td 6921 ft, perforated 5945 to 5958 ft, ran tubing, swabbed, no fluid, to further test.

SAN JOAQUIN COUNTY—Standard's Woods 1, 24-1-5, spud 5/21, dr shale 2995 ft. Texas Co.'s Lawrence-Stephens 1, 8-1-6, lcn.

SOLANO COUNTY—Amerada Pet. Co.'s Marks 1, 24-4-2, td 4450 ft, ran 4¾ in, perforated 308 ft, not tested, shut in; Marks 2, 22-4-2, dr shale 2430 ft.

SUTTER COUNTY—Buttes Oilfields' No. 4, 2-15-1, td 5800 ft, fsh.

TULARE COUNTY—E. P. Jennings' No. 1, 4-24-23, td 2707 ft, plug 2309 ft, sd; No. 2, 33-23-23, rig. Trico Oil & Gas Co.'s Valley 1, 36-21-25, td 4337 ft, in slate, abn.

MONTEREY COUNTY—Amil A. Anderson's No. 1, 15-24-14, dr hard sand 1090 ft. Shell Oil Co.'s Branch 2, 34-24-10, td 8662 ft, plug 8045 ft, to be abandoned.

SAN LUIS OBISPO COUNTY—Aviation Oil Co.'s Britnall 1, 10-11-35, td 1930 ft, redr to 1200 ft, sd. Barnsdall Oil Co.'s K.C.L. A-1, 1-32-20, (Carrizo Plains) td 5220 ft, recovered dr pipe, abn. I. L. Burch's No. 1, 3-10-26, sd 3209 ft. Burkholder Oil Corp.'s Clay 1, 14-10-26, sd 3252 ft. Gretna Corp.'s Miano 1, 25-30-10, dr shale 1560 ft. A. O. Lewis' Pecho 1, 34-30-10, dr shale 2610 ft. Pismo Pet. Co.'s No. 1, 5-32-13, sd 4425 ft. Temblor Oil Co.'s No. 1, 22-31-21, dr gray sand 1630 ft. Oscar Willett's No. 1, 27-26-13, spud 5/21, dr.

SANTA BARBARA COUNTY—E. C. Arnold's Arnold-Apache 2, 8-8-33, dr brown shale 2490 ft. Cohn & Mitchell's Giacomiani 1, 18-10-34, td 3700 ft, wocs 11 ¾ in at 1925 ft. Hancock Oil Co.'s Los Alamos 2, 6-7-32, rig. Leora Oil Co.'s Fithian 1, 8-4-25, sd 1025 ft. Murdock & Allen's No. 1, 16-7-30, material. Nine Springs Oil Co.'s Brinkinhoff 1, 9-7-30, td 3300 ft, wocs 8⅝ in at 2750 ft. Oatman Rainbow Gold Mining Co.'s Midwest L-1, 28-4-27, td 2054 ft in oil sand, wocs 8⅝ in at 1980 ft. Pacific Western Oil Co.'s Hobbs 1, 21-10-34, rur. S. E. D. Oil Co.'s No. 1, 27-10-34, dr shale 750 ft. Tide Water Associated's Leonis 1, 3-6-33, bldg rig. Union Oil Co.'s Russell 1,

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21-10-34, dr shale 3900 ft. Valley Oil Co.'s Chief 1, 20-9-34, td 2315 ft, to test on pump.

SANTA CRUZ COUNTY—Elba Oil Co.'s Elba 1, 6-12-1, rig.

VENTURA COUNTY—Continental Oil Co.'s Casitas 1, 7-3-23, dr hard shale 7603 ft. El Rio Oils-Canada's El Rio 1, 6-1-21, td 3000 ft, showed a little oil at 2780 ft, now standing cemented. Speik Oil Co.'s Speik 1, 35-5-19, dr shale 2475 ft. Giovanni Vai's Scott 1, 4-4-21, dr shale 250 ft.

SOUTHERN CALIFORNIA

NEWHALL — Barnsdall Oil Co.'s Rancho San Francisco 1, 26-4-17, td 6472 ft, pumping 150 bbls 36.8 gravity oil, cut 0.1 per cent; No. 2, foundation. Hobrook Pet. Co.'s No. 1, Newhall land, 28-4-16, sd 5365 ft. Towsley Canyon Oil Co.'s No. 1, td 3200 ft, to redr.

WALNUT—Julian & Criswell's Langstaff 1, 5-2-9, td 1805 ft, co.

MONTEREY PARK—London Oil Co.'s No. 1, 26-1-11, rig.

PALOS VERDES HILLS—McClaren Bros.' No. 1, 27-4-14, td 3970 ft, redr to 1870 ft, bailing.

ORANGE COUNTY—Mesa Oil Co.'s Mesa 1, (Newport) 29-6-10, dr hard shale 7631 ft. Richfield Cons. Oil Co.'s Todd 1, 22-3-9, dr sand and shale 750 ft. Signet Oil Co.'s Signet 1, 21-3-9, dr sand and shale 1350 ft. West American Oil Co.'s Irvine 1, (near Tustin) 14-5-9, dr sand and shale 3690 ft.

KANSAS

BARBER COUNTY — Pryor & Lockhart's Gant 1, cse¼ 7-31s-13w, dr 2323 ft. Barbara Oil Co.'s Holmes 1-27, cnw nw 27-33s-13w, dr 776 ft. Colonial Oil Co.'s J. W. Blunk Estate 1, ne ne ne 13-24s-14w, mim. W. I. Southern, Inc.'s Davis 3, se se ne 24-34s-15w, rot rig.

BARTON COUNTY—C. L. Price et al's Kraft 1, sw nw ne 10-17s-11w, 3288½ ft, td, acid/w 3000 gals Pot. P. 1904 bbls oil, comp. Geo. Dickey et al's Boger 1, se se ne 15-16s-13w, abd 3389 ft. Wakefield et al's Scheuermann 1, ne ne sw 31-16s-15w abd 3580 ft. Stanolind's Struder 1, se se sw 26-16s-13w, 3409-12 ft, so. Magnolia's Zink 1, nw nw se 13-18s-11w, abd t3326 ft. Republic Nat. Gas Co. and Continental's Moeder 1, ne ne sw 25-17s-13w, dr 2130 ft. Stanolind and I.T.I.O. Co.'s National Bank 1, se se sw 36-16s-13w, lcn. Sam Murphy's Beck 1, ne ne ne 17-17s-12w, rig. Hanna's Luce 1, sw sw sw 21-20s-13w, rur.

BUTLEY COUNTY — Vickers Pet. Co.'s Voth 1, cnl s½ sw ne 32-24s-4e, sd 3143 ft. Simpson Oil et al's Dennis 1-A, ne ne sw 15-26s-6e, dr 840 ft. Maurer & Saco Oil Co.'s Connell 1, ne ne sw 27-29s-5e, ru. Kahn et al's Madden 1-A, sw sw ne 27-23s-4e, td 2225 ft, acid/w 4000 gals; Pot. P. 30 bbls oil and 60 bbls water, comp.

CHASE COUNTY—Propp et al's Fromm 1, se se se 29-18s-9e, dr 2735 ft.

CHAUTAUQUA COUNTY—E. I. Shaffer's Nuckalls 1, nw nw nw 12-33s-9e, dr 2560 ft. Robinson et al's Foster 1, sw sw sw 6-33s-12e, dr 1235 ft. C. L. Brosius et al's Garrett 1, nw sw nw 26-32s-11e, spd. Buffington & Cohen's Hayes 1-A, se ne se 10-33s-13e, run 6-in csg.

COWLEY COUNTY — Ryan Consolidated's Couch 1, sw sw se 13-30s-5e, testing. Elmer Ash et al's Bolack 1, nw nw se 22-32s-6e, dr 3090 ft. Bess & Gralapp et al's Wakefield 1, ne se sw 18-30s-6e, td 3035 ft, D & A. Murta & Wilson's Turner 1, ne ne nw 30-32s-6e, dr 1930 ft. Blair, Continental & McKnab's Miller 1, ne nw sw 14-32s-5e, dr 1285 ft. Tulsa Oil et al's Dillon 1, nw nw ne 28-34s-3e, rig. McCoy, Amerada & Wentz's Anderson 1, se nw ne 34-34s-6e, fsg 1685 ft. Tom Palmer et al's Ogroskey 1, se se nw 31-32s-5e, dr 1660 ft. Trees Oil Co.'s Hornbeck 1, nw nw nw 5-33s-4e, ru.

EDWARDS COUNTY—Royal Pet. Co. et al's Krupp 1, nw nw se 18-24s-19w, dr 4693 ft.

ELK COUNTY — Republic Nat. Gas Co.'s Glasscock 1, se ne sw 19-31s-11e, dr 243 ft. G. T. Berry's Zimmerman 1, sw ne se 15-30s-10e, dr 491 ft.

ELLIS COUNTY—Empire's Samuelson 1, ne ne ne 31-11s-16w, woc. Maxda Oil Co.'s Henderson 1, sw sw ne 27-11s-18w, set 6 in csg 3437 ft. Noble Pet. Corp.'s O'Laughlin 1, nw nw se 13-12s-19w, wih 3493 ft, sd. Bridgeport Mach. et al's Froelick 1, nw nw se 4-13s-16w, testing. J. C. Shaffer, Inc.'s Staab 1, se se se 25-12s-18w, abd 3841 ft. Twin Drlg. Co. et al's Craig 1, ne ne se 6-11s-16w, dr 3500 ft. Elwell & Trees Oil Co.'s Wickham 1, sw sw ne 10-11s-19w, abd 3654 ft. Billings' Smith 1, se se nw 14-12s-16w, dr 2627 ft. Earl Wakefield et al's Burnett 1, nw nw ne 1-11s-18w, rig. Austin Drlg. Co.'s Karlin 1, nw nw nw 13-12s-18w, rig. Winkler & Koch's Jensen 1, sw sw ne 3-13s-18w, ru.

ELLSWORTH COUNTY — Orville Lee's Larkin 1, nw nw nw 15-16s-8w, set 8-in csg 2595 ft. Frost et al's Dolechek 1, ne ne sw 36-14s-8w, fsg 2285 ft.

GREENWOOD COUNTY — B & B Co.'s Webb 1, cne se 3-26s-13e, fsg 1115 ft. Ward McGinnis et al's Hanley Estate 1, sw sw sw 25-25s-9e, dr 1670 ft.

HAMILTON COUNTY — Barnsdall et al's Porter 1, sw sw ne 30-25s-41w, dr 3068 ft.

HARPER COUNTY—Carter et al's Seibert Estate 1, csw nw 4-34s-8w, shot & made 1 bbl water per hr & sso.

HARVEY COUNTY—E. J. & E. B. Shawver's Hege 1, ne ne se 26-22s-2w, abd 3027 ft. Simpson & Noble et al's Pierce 1, sw se ne 25-22s-2w, dr 635 ft. Shaffer et al's Epp 1, se se sw 15-23s-3w, rot rig. Hollow & Bradley's Nevfeldt 1, ne se nw 17-22s-1w, dr 269 ft.

KEARNEY COUNTY—J. L. Murphy's Masonic Home 1, cnw¼ 1-26s-36w, dr 500 ft.

LOGAN COUNTY—Rosespring Drlg. Co. et al's Wright 1, cse se 12-15s-35w, dr pipe stuck at 4910 ft.

LYON COUNTY—Davis & Sory's Byrd 1, sw sw se 32-21s-11e, abd 1981 ft.

MARION COUNTY—Western Kansas O&R et al's Suderman 1, se sw nw 22-20s-2e, cel.

McPHERSON COUNTY — Bradley Bros.' Barnholt 1, sw sw se 30-20s-5w, dr 2875 ft. Smith et al's Parson 1, nw nw sw 35-18s-5w, dr 2155 ft. C. E. Ash Drlg. Co.'s Broman 1, ne ne nw 19-17s-4w, rig. Fred C. Frank et al's Doles 1, se nw ne 12-19s-1w, dr 950 ft.

MITCHELL COUNTY—Geo. Seidhoff et al's Greiss 1, sw sw se 16-8s-10w, dr 3200 ft.

NESS COUNTY—Newton Dev. Co.'s Tenny 1, nw nw se 19-18s-25w, sd 4379 ft. Jones & Lane's Page Milling Co. 1, se se nw 36-18s-26w, rig.

PRATT COUNTY—Atlantic, Empire and Skelly's Runyon 1, sw nw ne 11-27s-13w, rur.

RENO COUNTY—Clyde Pulse et al's Payne 1, sw nw ne 4-22s-7w, set 6-in csg 3243 ft. Imo O&G Co. et al's Watkins 1, se se se 14-22s-7w, dr 1700 ft. Sinclair Prairie's Nett 1, nw nw se 32-26s-4w, abd 4184 ft. Carter, Continental & Empire's Bontrager 1, C-54, ce½ ne ne 26-24s-5w, cel.

RICE COUNTY—L. E. Douglas' Coyne 1, ne se se 24-21s-8w, 300 ft wih & so. John Hanna et al's Fulton 1, nw nw ne 24-19s-6w, run 6-in csg 3348 ft. Fred Phillips et al's Hubenett 1, sw ne sw 23-20s-8w, co 3198 ft. Union et al's Baker 1, sw sw ne 33-20s-6w, ur 8-in csg. Comanche Oil Co.'s Cramm 1, sw sw se 15-19s-9w, set 8-in csg 2288 ft. Hipple et al's Wernett 1, ne ne nw 11-20s-6w, dr 2310 ft. Shell's Haxton 1-B, ne ne sw 29-18s-9w, abd 2803 ft. Stanolind's Mooney 1, ne ne sw 5-19s-10w, dr 2338 ft. Skiles et al's Helmer 1, nw nw ne 7-19s-8w, dr 1825 ft. Witt et al's Fair 1, ne se se 4-22s-8w, set 10-in csg 1890 ft. Skiles et al's Campbell 1, se se ne 28-19s-9w, cel.

ROOKS COUNTY—Lester & Dean's Burtt 1, se se ne 29-10s-20w, fsg 3818 ft. Basin Oil Co.'s Baxa 1, ne ne ne 23-9s-17w, td 3630 ft. Brunson Drlg. Co. et al's Casey 1, se se ne 22-9s-16w, dr 2705 ft. C. R. Craft et al's Ziegler 1, ne ne sw 8-10s-16w, set 8-in csg 2860 ft, rust. S. C. Hoel et al's Ives 1, sw sw ne 11-7s-18w, set 12-in csg 1060 ft, co. W. W. Kiskadden et al's Ham 1, sw sw nw 25-7s-19w, mim. Graham et al's Fike 1, sw sw sw 9-9s-17w, td 3364 ft, small inc in oil.

RUSSELL COUNTY—Goldstein & Vernon O&G Co.'s Steinert Estate 1, ne se sw 34-15s-15w, dr 2230 ft. Aylward et al's Jones 1, se se nw 22-14s-13w, dr 1600 ft. Equity Gas Co.'s Harbauh 1, nw ne sw 19-13s-12w, dr 2950 ft.

RUSH COUNTY—S. A. Murphy et al's Roth 1, nw nw sw 21-16s-18w, dr by 2635 ft. Duee & Brouk's Lebsack 1, se se ne 13-16s-16w, dr 2389 ft. Westgate-Greenland Oil Co. et al's Greenwalt 1, nw nw ne 19-19s-16w, dr 310 ft. Carter et al's Prosch 1, cel n½ se 21-18s-16w, dr 385 ft.

SCOTT COUNTY—Olson Drlg. Co. et al's Nolan 1, nw nw ne 13-19s-33w, circ 4777 ft.

SEDGWICK COUNTY — Cameron et al's Smith 1, sw se se 13-27s-2e, pb 2388 ft. Roxanna Drlg. Co. et al's Woodman 1, sw nw sw 26-26s-1w, sd 2469 ft. E. B. Shawver's Furman 1, sw ne se 24-29s-3w, dr 615 ft. Union et al's Howell 1, sw sw sw 6-29s-1e, cel.

STAFFORD COUNTY—W. P. Faulkner's Schulz 1, se se ne 6-22s-13w, ru. Rosespring Drlg. Co. et al's Gray 1, nw nw nw 11-24s-13w, rur. Atlantic's Kachelman 1, se nw nw 13-25s-14w, rur.

SUMNER COUNTY—Graham et al's Dawson 1, nw nw nw 4-23s-2w, fsg 4255 ft. Texas Co.'s Harper 1, ne sw se 9-30s-3w, ur 6-in csg 4390 ft. Glimac Oil Co. et al's Proud 1, sw se se 33-30s-1w, rust 3631 ft. John Burrton et al's Springate 1, ne ne sw 30-33s-2e, rig. W. M. McKnab's Blair 1, sw sw sw 7-30s-1e, brr.

TREGO COUNTY—W. I. Southern's Latimer 1, nw nw se 19-15s-22w, set 8-in csg. Turner et al's Rogers 1, csw¼ 3-15s-23w, cel.

WOODSON COUNTY—M. B. Allen's Flack 1, ne ne nw 1-26s-14e, pb td 1337 ft, I.P. 2,300,000 cf gas, comp.

NORTH LOUISIANA

BIENVILLE PARISH—DeSoto O&G Co.'s Wm. Ashley 1, sw se 15-16n-10w, 10¾ in csg 2100 ft, woc (corrected), Wm. Ashley 2, 15-16n-10w, lcn. Hunt & Seaboard's Good Pine 1, c se se 30-14n-5w, woc 410 ft. Lide & Greer's W. J. Smelley 1, se ne sw 18-16n-4w, elev 231 ft, top Travis Peak 6796 ft, tested

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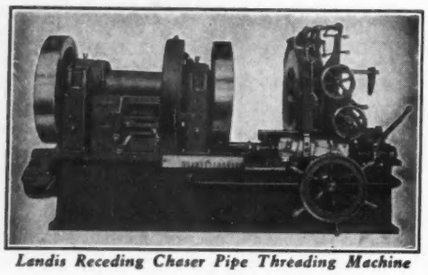

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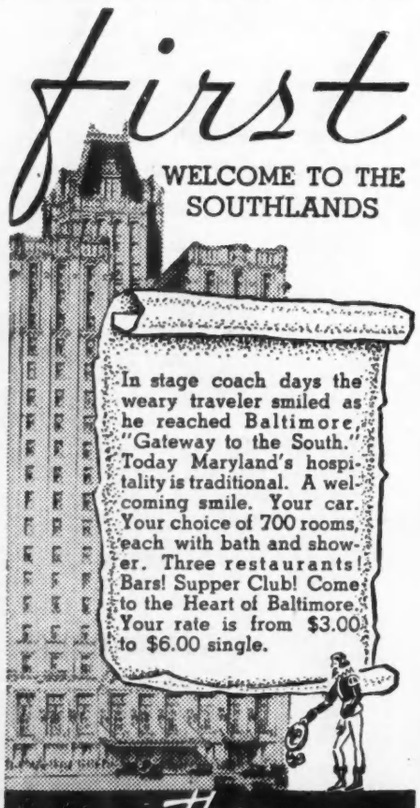
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est 50 mil ft wet gas 7144-80 ft, cemtd 7-in csg 7093 ft, td 7180 ft.

CADDO PARISH—W. J. Hnnter's N. B. Stoer 1, 10-15n-15w, sr 5550 ft. R. W. Norton's Payne 1, se se 27-23n-16w, coring 9978 ft. Fallon Oil Co.'s Cupples 1, 24-16n-13w, old well running 5¾ in csg at 4900 ft, td 5675 ft.

CLAIBORNE PARISH—Bevill et al's Alex Edmonds 1, ne ne 16-20n-5w, dr 3020 ft. United Gas et al's Carter Unit 1, 32-20n-5w, tested est 12 mil ft gas 5601-45 ft, cemtd 5¾ in csg 5722 ft, testing, td 5748 ft (Travis Peak). J. B. Bond's Burgess 1, 3-20n-5w, arr acidize, td 5800 ft.

DE SOTO PARISH—Grogan Oil Co. et al's Ramsey A-1, se nw 36-11n-11w, spd. Chamberlin et al's Lanier 1, 29-11n-11w, sd 3022 ft for heavier rig. Pearl Oil Corp. et al's Joyner 1, 28-11n-12w, install heavier rig 3030 ft.

FRANKLIN PARISH—Jensen et al's Grayson 1, c ne 36-12n-6e, top Cockfield 575 ft, setting csg, td 1811 ft (Cane River).

GRANT PARISH—R. W. Fair et al's R. L. Gay 1, 46-6n-3w, so 2888 ft, arr core. H. M. Smith & J. V. McConnell's McNeely 1, 16-6n-3e, arr deepen 30 ft.

LINCOLN PARISH—Burford et al's Nanna 1, w½ se 34-18n-4w, lcn. H. D. Easton & Belmont Quadrangle Drlg. Co.'s G. W. Dye 1, ne ne 21-19n-4w, 13⅜ in csg 783 ft, dr 950 ft. E. T. Oakes, Easton & Evans' R. L. Sanderson 1, 30-18n-1w, dk. Glassell & Glassell's A. T. Gray 1, 16-20n-3w, elev 196 ft, lower anhydrite stringer 4190-4210 ft, core 4650 ft shale and lime.

MOREHOUSE PARISH—Rondeau et al's Clark 1, 10-20n-7e, owdd, td 3755 ft.

NATCHITOCHES PARISH — Jack Lent et al's Locke 1, 26-9n-9w, elev 201 ft, top Midway 1589 ft, top chalk 2459 ft, dr 2461 ft chalk. Roy Raines et al's Allen Plantation 1, nw ne sw 22-9n-10w, woc surf cas 220 ft.

RAPIDES PARISH—C. L. Decker's Lee Lba. Co. 1, se ne 21-5n-3e, dr 800 ft. F. W. Martin & Co.'s Hill 1, 24-5n-4w, fsg 580 ft. R. D. Webb's Brasher 1, 22-4n-2w, fsg 5255 ft.

RED RIVER PARISH—Whitehurst et al's Le Long 1, n½ 25-12n-11w, mim.

SABINE PARISH—Deep Rock Oil Co. & Kirk-Greenway's Whitney Corp. 1, 8-9n-13w, showed 4025 ft mud and sw in 6 hour test 5202-5709 ft, arr deepen to Travis Peak, td 5709 ft. A. C. Scott et al's Bowman-Hicks 1, 23-9n-13w, claim 4 ft sand so, 3085-88 ft, testing so, td 3088 ft.

WEBSTER PARISH—N. V. Duncan's Mayfield 1, 9-23n-9w, abn 3250 ft. Magnolia's D. G. Cox 2, 22-21n-10w, dr 948 ft; Ira Cox 6, 23-21n-10w, dr 5062 ft; G. W. Cole 2, 27-21n-10w, dr 4700 ft. Ohio's A. J. Hodges 2, 23-21n-10w, cemtd 7-in csg, woc, td 8476 ft; A. H. Gray 1, Acct. 2, 26-21n-10w, set 7-in csg woc, td 8409 ft. S. P. D. Coyle 1, 23-21n-10w, dr 8270 ft; R. M. Coyle 2, 22-21n-10w, dr 7674 ft; L. M. Gardner 1, 22-21n-10w, dr 6980 ft. Standard's Stewart 1, 32-21n-10w, elev 240 ft, base massive anhydrite 4761 ft, top Travis Peak 6005 ft, cored Holloway sand 6027-38 ft, no show, arr run electrical tester and set 9⅝ in csg, td 6042 ft. Woodley Pet. Co.'s Gray B-4, 27-21n-10w, 7-in csg set on bottom at 8444 ft, arr perf and test at Bodcaw horizon.

SOUTH LOUISIANA

ACADIA PARISH—Humble's Federal Land Bank 1, North Crowley prospect, 34-8s-1e, making drill stem test at 7939 ft. John Mayo et al's Bank of Commerce & Trust 1, e of Tepetate field, 19-7s-1e, lcn.

CAMERON PARISH—Humble's Bel Hanszen 1, Hanszen prospect, 5-12s-6w, dr shale 4019 ft. Pure's State Mallard Bay 2, Mallard Bay prospect, 14-13s-3w, lcn. Superior's State Gulf of Mexico 1, in Gulf of Mexico, 4-15s-8w, lcn.

EAST FELICIANA PARISH—Cavalier Oil Co.'s Bickman 1, Port Hudson area, 88-4s-1w, lcn; same operator's Elliott 1, 3-8s-2e, dr shale 1965 ft. G. C. Koch et al's Andrews 1, Clinton area, 69-2s-3e, 1096 ft.

EAST BATON ROUGE PARISH—Cavalier Oil Co.'s Jacocks 1, 69-4s-1w, abn 4422 ft.

IBERIA PARISH—Hamil & Smith's Dave Baez 1, Patoutville area, 35-12s-7e, dr shale 5649 ft. Jefferson Lake Oil Co.'s Lake Peigneur 414, Jefferson Island dome, 12s-5e, coring sand 6380 ft.

JEFFERSON DAVIS PARISH — Louisiana Crusaders Oil Co.'s Langley 1, Fenton area, 36-7s-5w, coring shale and sand with slight odor of gas 8214 ft. Stanolind's Calcasieu National Bank B-2, China prospect, 28-7s-3w, dr shale 7099 ft; same operator's Calcasieu National Bank 2, South Jennings area, 10-10s-3w, dr shale 8199 ft. Union Sulphur & Shell's T. R. S. Farms 1, South Roanoke area, 23-10s-4w, woc 1836 ft.

LAFOURCHE PARISH — Fohs Oil Co.'s State Long Lake 1, Bourg prospect, 65-17s-19e, coring sand showing oil 9391 ft. Gulf's State 3, sw of Marchland prospect, 36-23s-21e, mim.

PLAQUEMINES PARISH—Gulf's State Bay Adams "PP" 2, in Bay Adams, 32-19s-28e, dr shale 4668 ft; same operator's State Quarantine Bay "QQ" 3, 17-19s-17e, lcn. Tide Water's Manhatten Fruit Co. 3, Venice dome, dk.

ST. BERNARD PARISH—Gulf's Lake Lery 2, Lake Lery prospect, 28-14s-14e, dr shale 6320 ft.

ST. CHARLES PARISH—Amerada-Louisiana Land & Exploration Co.'s State Bayou Des Allemands 1, Black Prince Island prospect, 13-15s-20e, reported sand showing oil 6895 ft.

ST. LANDRY PARISH—Gulf's Haas-Hirsch 1, Krotz Springs area, 12-6s-7e, dr sand and gravel 240 ft.

ST. MARTIN PARISH—Joe E. Lilly et al's Martin 1, Section 28 prospect, 32-10s-7e, dr shale 4067 ft. Texas Co.'s State Mongoulio 3, Lake Mongoulio prospect, 14-10s-9e, washing 7600 ft.

ST. MARY PARISH — Texas Co.'s State Bateman Bay 1, Morgan City prospect, 21-16s-12e, dr shale 10,031 ft; same operator's Horseshoe Bayou 1, on Horseshoe Bayou, 40-17s-9e, moving in drilling barge, 12,261 ft.

VERMILION PARISH—Continental's Brookshire 1, Abbeville area, 66-12s-3e, dr shale 681 ft.

MICHIGAN

ALLEGAN COUNTY — Champion Dev.'s Sikor 1, ne ne ne 9-1n-12w, lcn. Flanigan & Kehlet's Clair 1, sw ne se 29-1n-13w, lcn.

ARENAC COUNTY—E. H. Linaberry's McTaggart 1, se ne se 26-19n-33, rig.

GRATIOT COUNTY—Sam Siegel's Kerr 1, 36-9n-1w, sd 2250 ft. H. B. Cowdrey's DeVuyst 1, 11-10n-2w, rig. Gulf Ref. Co.'s Lyon 1, 26-9n-2w, dr 2600 ft.

HILLSDALE COUNTY—Jacob Beck's Fee 2, 15-6s-3w, woc 2700 ft. Huges Heinig's Daley 1, 10-7s-4w, fsg 1500 ft.

NEWAYGO COUNTY—M. R. Schemahorn's Cain 1, 24-12n-11w, lcn. Muskegon Dev. Co.'s Carlson 1, 9-16n-12w, dr 500 ft.

OTSEGO COUNTY — Geraldine Trustee's Fee 1, 34-30n-3w, lcn. Harley William's Raae 1, 15-30n-1w, sd 2250 ft. Barton & William's Yuill 1, 9-32n-3w, lcn.

SAGINAW COUNTY—Darke Brothers' Hart 1, 11-11n-3e, dr 230 ft. Doran & Hillard's Dobs 1, 33-11n-1e, rig. Mid West Pet.'s Shields 1, 5-11n-2e, dr 1340 ft.

MISCELLANEOUS—Cass: L. T. Barber's Beebe 1, sec 3-5s-15w, sd 1250 ft. Cheboygan: Bert Brancis' Campbell 1, sec 7-34n-1w, lcn. Emmet: Cheboygan Oil Co.'s Barney 1, sec 12-35n-4w, spd. Missaukee: Rex Oil Co.'s Meekoff 1, sec 30-21n-6w, fsg 3000 ft. Tuscola: C. W. Spaulding's Dalrymple 1, sec 35-10n-7e, lcn.

OKLAHOMA

ALFALFA COUNTY—Olson Drlg. Co. et al's Acre 1, csw ne 14-24n-1w, fsg 3700 ft.

ATOKA COUNTY—A. J. Sander's Redden 3, se sw sw 19-1n-15e, abd 1260 ft.

BECKHAM COUNTY — Mid-American Oil Co.'s Biscoe 1-A, sw sw sw 28-8n-22w, fsg 1945 ft. Carter's Porter 1, csw sw 36-10n-25w, woc 3635 ft; Bingham 1, ne ne ne 31-8n-26w, dr 1928 ft.

CADDO COUNTY — Clyde Becker et al's Pharris 1, cse se nw 24-6n-12w, dr 800 ft.

CARTER COUNTY—Shell's Smith 1, cnw se ne 30-5s-1e, rur.

GARFIELD COUNTY—Ohio's State 1, sw sw sw 13-23n-2w, dr 4870 ft.

GARVIN COUNTY—Carter's Potts 1, ce½ se nw 36-1n-3w, C & P.

GRANT COUNTY—Carter et al's Crisman 1, nw sw nw 16-25n-3w, rig; Kolarik 1, csl s½ sw 4-26n-5w, rig.

GREER COUNTY — Nelf-Godfrey-Andrea's Melton 1, cse nw se 16-3n-22w, abd 4522 ft.

HASKELL COUNTY—Continental's Anderson 1, sw se ne 33-8n-20e, dr 4080 ft.

HUGHES COUNTY—Cap Rock Oil Co.'s Parks 1, csw se 34-7n-8e, dr 4020 ft. Chas. Thornton's Eason 1, ne ne nw 7-9n-11e, dr 1240 ft. E. H. Moore's Buck 1, nw sw sw 21-8n-10e, td 2725 ft, to run 10-in csg.

JACKSON COUNTY — Ace Gutowsky's Howard 1, sw sw nw 10-3n-19w, dr 300 ft.

JEFFERSON COUNTY—Olson, Heenan & Coe's Rose 1, csw sw 1-5s-5w, abd 5024 ft.

JOHNSTON COUNTY — Neff-Godfrey's Chapman 1, csw se sw 36-4s-4e, lcn.

KAY COUNTY—Higdon et al's Nieman 1, ne nw ne 9-26n-3e, fsg 519 ft.

KIOWA COUNTY—Kiowa Oil Corp.'s Finder 1, csw ne 4-6n-20w, sd 130 ft. Argus Pet. Co.'s Osbourne 1, nw nw ne 9-7n-16w, co.

LATIMER COUNTY—Clark Drlg. Co. et al's Wilson 1, cse se 15-5n-18e, dr 5448 ft.

LINCOLN COUNTY — Mid-Continent Pet. Corp.'s Logan 1-A, ne ne se 31-11n-5e, td 4844 ft, acid/w 2000 gals, Pot. P. 200 bbls oil and 80 bbls water, comp. Exchange Drlg. Co.'s Dowell 1, se se nw 10-14n-6e, td 3065 ft, to shoot.

LOGAN COUNTY—Helmerich & Payne et al's Randall 1, sw sw ne 24-16n-1w, dr 4297

ft. Eason Oil Co.'s Sisters 1, sw sw sw 24-17n-1w, dr 5423 ft.

LOVE COUNTY—Sinclair Prairie's Stockton 1, se se sw 26-6s-2w, set 5½-in csg 6624 ft, woc.

MARSHALL COUNTY—Stewart & Taylor's Chestnut 1, ne ne ne 23-8s-5e, testing.

McCURTAIN COUNTY—Wilcox O&G Co.'s No. 1, sw se sw 30-2s-27e, matr on grnd.

MURRAY COUNTY—Russell's Fee 1, se nw se 9-2s-3e, dr 2134 ft. O. O. Owens' Fryer 1, ne se ne 34-1s-3e, dr 1812 ft.

NOBLE COUNTY—Lincoln Oil Co. et al's Neil 1-A, ne nene 15-23n-2w, fsg 4826 ft. Summitt Drlg. Co. et al's Dolezal 1, se se sw 8-22n-1w, dr 4965 ft. Magnolia's Forsythe 1, se se sw 23-21n-2w, ream cor hole at 5293 ft. Stanolind & Amerada's Johnson 1, nw nw se 4-20n-2w, dr 1475 ft.

OKLAHOMA COUNTY—Sunray Oil Co.'s Dickson 1, nw nw nw 17-11n-1e, mit.

OSAGE COUNTY — Helmerich & Payne's No. 1, ne ne se 13-23n-6e, td 2825 ft, D & A. Mid-Co Oil Corp.'s No. 1, se se sw 22-23n-6e, under-digging 10-in csg, td 1320 ft.

PAWNEE COUNTY—Carter's Wells 1, ce½ se nw 30-23n-5e, set 15-in csg 63 ft, dr 415 ft.

PAYNE COUNTY—H. F. Young's Jenkins 1, se ne se 4-17n-3e, dr 4595 ft. Riddle's Van Zandt 1, nw nw se 16-18n-3e, dr 2300 ft.

PONTOTOC COUNTY—Roodhouse et al's Booth 1, se nw se 20-2n-6e, dr 2770 ft. Clark Drlg. Co. & Delaney's Richardson 1, se se sw 30-4n-8e, spd. Sandbach et al's Whittaker 1, nw ne se 31-4n-6e, dr 2620 ft. Boettcher O&G Co.'s Cann 1, se nw ne 25-4n-7e, dr 800 ft. Norbla Oil Co.'s Kennedy 1, se se ne 13-2n-5e, mach, spd.

POTTAWATOMIE COUNTY—Stanolind & Amerada's Billington 1-B, sw se sw 32-9n-3e, dr 3235 ft. Rich Oil Co.'s Fidler 1, ne ne nw 9-5n-5e, sd. Atlantic's Dooley 1, se se sw 9-11n-5e, woc 205 ft.

PUSHMATAHA COUNTY—Erle Halliburton et al's Bogwell 1, sw ne ne 30-3s-15e, cor.

SEMINOLE COUNTY—Amerada & Stanolind's Reed 1, se sw se 19-10n-8e, abd 3618 ft.

STEPHENS COUNTY—Edward's Frederick 1, ne se nw 31-2n-8w, abd 2754 ft. Carter et al's Harley 1, cne ne 24-2s-4w, dr 5545 ft. Penn State Oil Co.'s Cole 1, cw½ sw ne 21-2n-8w, abd 5575 ft. Coline Oil Co.'s Johnson 1, csw se ne 1-2n-8w, to dd. Ed Parson et al's Blake 1, csw nw 22-2n-8w, bldg der. Helmerich & Payne's Graham 1, csw sw ne 12-1n-5w, td 5014 ft, mirt.

TILLMAN COUNTY—I.T.I.O. et al's Hatler 1, csw ne 32-2s-17w, pumping. Magnolia's Brown 1, csw se ne 21-3s-18w, dr 6145 ft. Cavens et al's Southerland 1, sw sw nw 35-4s-16w, rur. Eugene Skinner's Oliver 1, se se nw 22-1s-15w, abd 1387 ft.

WASHITA COUNTY — John Koberg's Harms 1, cnw nw ne 6-10n-16w, spd 50 ft.

EAST TEXAS

ANDERSON COUNTY—Barnsdall's H. C. Swanson 1 (243-ac), Richard Duty sur, ¾ mi ne Jarvis, elev 330 ft, Pecan chalk 3314-3630 ft, base Austin chalk 4264 ft, top Woodbine 4406 ft, testing 4438 ft. Roeser-Pendleton, Inc.'s V. W. Bowyer 3 (200-ac), E. Ritter sur, Cayuga field, elev 317 ft, top Woodbine 3991 ft, top Georgetown 4749 ft, top Paluxy series 5929 ft, top Glen Rose 6166 ft, top first anhydrite 7110 ft, dr 7500 ft. Tide Water-Seaboard's Monnig Bros. 7 (3806.82-ac), S. Sanchez sur No. 1-11, Long Lake field, elev 233 ft, top Woodbine 5273 ft (salt water), top Georgetown 5904 ft, top Paluxy 7010 ft, top first Glen Rose 7205 ft, top first anhydrite 8333 ft, massive anhydrite 8643-8748 ft, top Travis Peak 9930-9971 ft, no saturation, pb to 5260 ft and try to complete in Sub-Clarksville.

BOWIE COUNTY—Fay T. Chew and Brassett's B. Barkman 1 (90-ac), J. W. Parkman sur, 2½ mi n LYeary, elev 312 ft, dr 1410 ft. Ferguson & Hill's A. Y. Breckenridge 1 (412-ac), Nancy Dycus sur, 4 mi w Texarkana, top Annona chalk 1308 ft, top Blossom sand 2063 ft, sd repairs 2701 ft. Sutton & Hawkins' N. M. McDuffey-Harris 1 (389.45-ac), John Ball sur, 3 mi se New Boston, elev 333 ft, top Georgetown lime 2847 ft, top Paluxy 3350 ft, top anhydrite stringer 4495 ft, massive anhydrite 4640-4825 ft, coring 5090 ft. Mrs. S. O. Thompson & H. H. Jaffe's C. W. Rosemond 1 (425¼-ac), Jefferson Milam sur, 3 mi sw Red Water, elev 285 ft, top lower Cretaceous 3530 ft, top anhydrite 5278 ft, massive anhydrite 5460-5698 ft, dry and sd in lower Glen Rose 6008 ft. Woodley & Bentley's J. D. Lumpkin 1 (245-ac), John McDermott sur, 1¼ mi sw of Dalby Springs, elev 290 ft, Annona chalk 1665-2090 ft, td 4404 ft, pb and dr new hole 3810 ft.

CHEROKEE COUNTY—Stooco Oil Co.-Joe M. Burnham's E. B. Parks 1 (17 2/3-ac), J. T. Cook sur, 4 mi sw Rusk, elev 417 ft, top Pecan chalk 3939-4330 ft, Austin chalk 4825-5058 ft, top Woodbine 5060 ft, testing 5067 ft.

COLLIN COUNTY—Foster Jones et al's Ann Sherley 1 (54.44-ac), Gwynn Morrison sur, ½ mi e Anna, top Paluxy 2123 ft, top first anhydrite 2725 ft, sd repairs 3005 ft.

DELTA COUNTY—F. J. Estes et al's W. S. McGee 1 (207-ac), J. G. Oliver sur, 2 mi sw Klondike, elev 449 ft, top Georgetown 3305 ft, sd 4401 ft.

FALLS COUNTY—J. Edward Mills et al's Sam Grucholski 1 (40-ac), Dennis Herold sur, 5 mi sw Kosse, elev 521 ft, top Edwards 3867 ft, top upper Glen Rose 4074 ft, td 5526 ft, cem 5-in cas 5374 ft, pb and gun perforated cas 5284½-88½ ft, flowed water, pb to test Glen Rose.

FREESTONE COUNTY—C. F. Lytle et al's Roy Simmons 1 (28.83-ac), R. B. Longbotham sur, ½ mi s Wortham, Trinity test for depleted field, sd 3820 ft. C. E. Rossiter et al's J. P. Fulton 1 (441-ac), J. P. Fulton sur, lcn. L. R. Stroud & C. A. Buzzard's Sneed 1, R. D. Sloan sur, 6 mi ne Fairfield, sd 341 ft.

HENDERSON COUNTY—Wm. McDougall, Tr., et al's Trinity Farm Securities Co.-R. M. Manning 1 (200-ac), H&TC Ry. sur, 4 mi s Malakoff, mim. Tidewater-Seaboard & Humble's McElreath-Suggett 2-C (149-ac), W. P. Wyche sur, 1½ mi nw Opelika, elev 394 ft, dr 1500 ft.

HOPKINS COUNTY—Carpenter Oil Corp.'s C. D. Gillis 1 (53¾-ac), W. A. Smith sur, 2¾ mi e Cumby, elev 593 ft, sd 3715 ft. Housh & Thompson, Inc., E. L. Ashcroft & Bob Nelson's Spencer 1 (81-ac), G. Linceum sur, rur. H. & W. Development Co.'s Pan-American Life 1 (136½-ac), Agaton Caro sur, 6 mi se Brashear, elev 506 ft, Pecan chalk 2159-2272 ft, top Eagleford shale 3845 ft, top Woodbine 4412 ft, dry and abd 4456 ft.

HOUSTON COUNTY—American Liberty et al's W. L. Moody 1 (55-ac), S. C. Parker sur, 2½ mi nw Grapeland, dr 3700 ft.

HUNT COUNTY—Stanolind et al's Hawks 1 (110-ac), Robt. Ragsdale sur, 1½ mi w Campbell, elev 566 ft, cut through fault 1275 ft, top Woodbine 2880 ft, top Georgetown lime 3730 ft, top Paluxy series 4388 ft, top Glen Rose 4819 ft, anhydrite 5335-5560 ft, dr 5820 ft.

KAUFMAN COUNTY—J. M. Scott & J. B. Woodside's Nash 1 (80-ac), Juan Cortez sur, 1 mi e Scurry, elev 401 ft, Gober chalk 1300-1400 ft, sd 2510 ft.

LAMAR COUNTY—H. W. McGee et al's J. M. Duck 1 (75-ac), J. C. Lamb sur, near Powderly, lcn. A. W. Ealker, Tr. et al's R. L. Rose 1 (160-ac), A. N. Nowell sur, lcn.

LEON COUNTY—H. M. Ogg et al's O. Wiley 1 (144-ac), E. Devinney sur, 1 mi w Buffalo, sd 2000 ft.

LIMESTONE COUNTY — Pure's W. B. Kendrick 16-T (96-ac), 3 mi w Mexia, Mexia field Trinity test, elev 508 ft, Austin chalk 2210-2522 ft, top Woodbine 2896 ft, dr 3980 ft. A. W. Phillips & J. Johnson's E. M. Wright 1 (136½-ac), A. Varella-M. Herrin sur, 4 mi ne Groesbeck, elev 415 ft, Pecan chalk 2450-2520 ft, Austin chalk 2720-3003 ft, sd 3695 ft.

RUSK COUNTY—Barnett Pet. Corp. (was John G. Mayo et al's) Harrison-S. C. Sanford 1 (161-ac), Wm. A. Corder sur, 10 mi e Mount Enterprise, Trinity test, elev 252 ft, sp and sd. General Crude Oil Co. et al's Bivens Bros. 1 (500-ac), R. Williamson sur, rur. John W. Merritt et al's J. M. Tipps 1 (250-ac), Thos. Uzzell sur, 3½ mi n New Salem, elev 367 ft, cem cas 110 ft. J. W. Shipman et al's Citizens Nat'l Bank-L. T. Burton 1 (125-ac),

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J. J. Y'Barbo sur, 4 mi ne Henderson, elev 432 ft, dr 3720 ft.

SMITH COUNTY—Thos. W. Doswell et al's Allred Bros. 1 (40-ac), B. Lafferty sur, 3½ mi n Troup, elev 444 ft, dr 1000 ft.

VAN ZANDT COUNTY—Humble's L. K. Riggs 1-A (74.2-ac), Wm. Daniel sur, ne edge Van field, Trinity test, dr 3400 ft. Glenn et al's E. Core 1, H. Ball sur, 3 mi n Edom, dk. Spratt Oil Co. (was Stroud & E. N. Lowe's), P. L. McNeill 1 (104-ac), J. W. Guest sur, 4 mi n Ben Wheeler, elev 510 ft, sd 684 ft.

EAST TEXAS BORDER COUNTIES

CASS COUNTY—McAlester Fuel Oil Co.'s J. J. Dooley 1, Calloway Davis sur, dry abn 6508 ft. Magnolia's Harper & Thatcher 1, Jacob Carsner sur, pb to 5965 ft, dry, td 6675 ft. United's J. W. Land 1, Robt. Potter sur, perf csg 6520-25 ft, tested est 7 mil ft gas and show dirt in basal Glen Rose 6533 ft, treated with acid and testing, old td 7255 ft.

HARRISON COUNTY — H. H. Alvord's Flannagan 2, L. Womack sur, 7-in csg 2421 ft, woc, td 2461 ft. Fields & Rector's Anderson Williams 1, G. P. Harrison sur, testing after acidizing, td 2395 ft. Geyer Oil Co.'s Vincent B-2, C. Davenport sur, 5-in csg 2362 ft, testing, td 2392 ft. Highway 80 Oil Co. of Texas' Mabel George 1, J. S. Powell sur, fsg 1020 ft. Patsam Pet. Corp.'s A. G. Vincent 1, G. P. Harrison sur, 7-in csg 2376 ft, treated with acid, testing, td 2396 ft.

MARION COUNTY—Ark. La. Gas Co.'s C. C. Braden 1, Thos. Hanson sur, elev 211 ft, top anhydrite stringer 5181 ft, base massive anhydrite 5687 ft, tested est 20 to 30 mil ft gas and some distillate at 5924-40 ft, cored coarse oolitlic lime medium porosity 5938-58 ft, cored 5958-78 ft, top 4 ft of that recovered so&sg, rest tight with sg, showed est 5 mil ft gas and 15 joints fresh water 5943-83 ft, dd (Gloyd). Laura McIntosh 1, Wm. Edmondson sur, claim so&sg 6654-65 ft, pb to 5980 ft, perf csg 5918-45 ft, tested est 925,000 ft gas and 12 bbls oil daily, acidized again, est 2 mil ft gas and 20 bbls oil daily, testing old td 6925 ft. Allen Houston 1, A. de los Santos Coy sur, spd setting surf cas. The Hunter Co.'s E. W. Fonda 2, A. de los Santos Coy sur, spd. Fohs Oil Co.'s Mary McReynolds 1, A. de los Santos Coy sur, rur. United Prod. Corp.'s J. H. Hutchinson 1, A. de los Santos Coy sur, mim. Mid-Continent Pet. Corp.'s Sory 1, A. de los Santos Coy sur, lcn.

PANOLA COUNTY—Danciger O&R Co.'s J. W. Tatum 1, Alfred Bissell sur, spd and rur. Glassell & Glassell's Pierce & Chesbro 1, Julia Soape sur, 16-in csg 922 ft, dr 3500 ft lime and shale. Magnolia Pet. Co.'s E. A. Hull 2, Thos. Applewhite sur, elev 222 ft, sg 5885-5900 ft, 9⅝ csg 5948 ft, well attempted to blow out, fsg, td 6010 ft. Socogee Oil Co.'s Trosper 1, Larkin Smith sur, pumping 12 bbls oil day, td 2445 ft.

SHELBY COUNTY — Wm. Reditt et al's Pickering Lbr. Co. 1, Stephen English sur, elev 303 ft, top Blossom 2310 ft, coring 3321 ft. Thos. Boswell et al's J. Allred 1, Ben Lafferty sur, spd, dr 950 ft. H. A. Stebbinger et al's Pickering Lbr. Co. 2, perf 5033-37 ft, tested 3 mil ft gas and 15 bbls distillate daily, 200 pounds working pressure, 2400 pounds closed in pressure, old td 5126 ft.

SOUTH TEXAS

SAN ANTONIO DISTRICT

BASTROP COUNTY—Marts & Beavans' R. A. Harris 1, Timothy McKean sur, top chalk 2830 ft, abnd 2898 ft.

BEXAR COUNTY — American Gas Co.'s Oliver 5, M. F. Rodriguez sur, resume dr 3425 ft. Carle Chemical Co.'s Carle 1, 343-ac tr, Del Rio clay 242 ft.

CALDWELL COUNTY—B. C. Armstrong et al's Wilson Bell 1, n portion Luling townsite, dk. R. T. Belcher's Moody 1, Solomon Seal sur, lcn. E. R. Cosby's W. H. Cosby 1, Maxwell sur, swabbed sul wtr and set btm hole plug, td 1847 ft. Fain Gillock's Walker 1, A. Floyd sur, lcn. J. O. Mack's B. Withers 1, W. House sur, dr 1150 ft. McNeil Pet. Corp.'s Will Clark 1, J. R. Miller sur, sp. Sherman Nelson's A. B. Etheridge 1, Thad Hunter sur, acidized pumping 15 bbls oil and 110 bbls sw per day, td 2180 ft. Rosita Oil Co.'s Lockhart State Bank 1, John Roe sur, dr 1400 ft. Richardson Pet. Co.'s Patterson 1, Wm. Pettus sur, dr 770 ft. Spokane Oklahoma O&G Co.'s K. Dougherty 1, J. Tyler sur, lcn. Stapper Pet. Co.'s E. Martin 1, A. Floyd sur, dr 1850 ft. F. R. Williams' H. L. Rodenberg 1, James Berry sur, struck crevice, lost returns, setting csg, td 2010 ft.

DIMMITT COUNTY — Paul C. Teas & Maryland Oil Corp.'s S. E. McKnight 1, sec 23, I&GN sur, lcn for 6750-ft test. Wilcox O&G Co.'s Light Ranch 1, I&GN sur, dr 6215 ft.

EDWARDS COUNTY—Dan Auld's Rigsby 1, GC&SF sur, dr 3720 ft. Amon G. Carter et al's Frank J. Sweeten Ranch 1, GC&SF sur, mim.

FRIO COUNTY—Amerada's Harrigan 1, Salvador Flores sur, dr new hole 3635 ft, td old hole 6290 ft. H. A. Pagenkopf & L. C. Jameson's Blackaller Est. 1, James Gourley sur, lcn for 3250 ft Edwards test.

GONZALES COUNTY — Canoe Creek Oil Co.'s W. L. Bolts 1, W. A. Matthews sur, sd. Tull et al's (Ready & Tull's) J. F. Bozka 1, B. McClure sur, abnd 2625 ft.

GUADALUPE COUNTY—R. T. Belcher's J. T. Fulcher 1, Robt. Smith sur, drlg Taylor marl 1895 ft. J. Kenneth Blackmar et al's Mackey 1, James Hodges sur, pump 40 bbls per day fluid 50 percent oil rest sw, td 2662 ft. J. E. Clark's Knodel 1, Green Dewitt sur, pumping 5 bbls per hour, td 2493 ft. Louis Crouch et al's King 1, J. D. Clements sur, comp for 20 bbls per day on pump, td 2230 ft. Ralph E. Fair, Inc.'s Fritz E. Hemple 1, G. W. Williams sur, having motor trouble, td 2025 ft. Felmont Oil Corp.'s Lizzie Schueneman 1, Green Dewitt sur, flowing 75 bbls per day through ¼-inch choke, td 2526 ft. Kennedy & Crowley's Gus Jahns 1, Jose K. Davis sur, running tubing, td 2507 ft. Riddle Oil Co.'s Ned Herff 1, Eligio Gotari sur, swabbing after perf in ch, td 2209 ft. W. Scott Townsend's Tom Terrill 1, Jesus Cantu sur, dr 1900 ft.

HAYS COUNTY—N. G. Williams' Frances Jennings 1, Venmonds sur, lcn.

KENDALL COUNTY—Claud Smith's J. M. Gerfers 1, Mark Hodgson sur, abn 1076 ft.

MEDINA COUNTY — Frank A. Brown's Jack Bilhartz 1, J. Campbell sur, lme 1377 ft, sd for csg. Frank A. Brown's A. E. Bruck's 1, John Ward sur, reinstate to dd, td 760 ft. R. S. Bynum, Jr.'s Mary V. Melton 2, James Fricker sur, comp for 2 bbls per day on pump, td 927 ft.

MILAM COUNTY—Kingdorr Explo. Co.'s White et al 1, Bynum Wickson sur, sp.

TRAVIS COUNTY—R. M. Kyle's W. D. Hunter 1, J. Burleson sur, dr 228 ft.

WILSON COUNTY—Maryland Oil Corp. et al's Tremmell 1, M. May sur, dr 3640 ft. R. C. Stanley's E. M. Hierholzer 2, Salina sur, lcn.

ZAVALLA COUNTY—H. F. Wilcox's Gilliam 1, GWT&T RR sur, flowed from 9:40 a. m. to 3:40 p. m., filled 7 ft in 5000 bbl tank oil 22 grav. at 104 degrees—correct 16.6 grav, 1½ percent wtr, fluid 124 degrees at well head, 6 in flow line on 7 in csg 1470 bbls or 210 bbls per hour.

CORPUS CHRISTI DISTRICT

ARANSAS COUNTY—Barnsdall's Edwards 1-A, Wm. Lewis sur, coring sticky shale 8189 ft.

BEE COUNTY—Butler & Turner's J. R. Scott 1, sec 7, Howeth & Swiger's sub, coring for Pettus at 4430 ft. J. R. Dougherty's R. T. Hicks 2, Holman George sur, dk. Lonnie Glasscock's J. B. Ablinger 1, John Ryan sur, junked, td 5945 ft. Illinois Pet. Corp.'s McKinney 2, L. C. Randolph sur, dst 4067-89 ft, 15 min rec 200 ft sw, Pettus sand, td 4089 ft. Fred Shields et al's Homer Harris 1, P. Wilcox sur, dr 3940 ft, top Vicksburg 3205 ft.

BROOKS COUNTY—Gifford Oil Co.'s Wm. Singer 1, sur .630, coring 2370 ft. Standard of Texas' Mestina 1, R. G. Salinas sur, coring 4349 ft; Mestina 6, R. G. Salinas gr, comp for potential of 75 bbls in 24 hrs, 20/64 in ch, tp 150 lbs, cp 400 lbs, no wtr (open new sand), will take additional gauge.

CAMERON COUNTY—Ruez-Morton, Inc.'s United Land Irr. Co. 1, lot 7, blk 402, El Jardin sub, dr 1545 ft, 10¾ in csg set at 1450 ft. Saxet Prod. Co. & A. W. Phillips' Port Isabell et al's 1, sh 29, Espiritu Santo gr, mir. Stapper Pet. Corp.'s Port Isabell Irr. Co. 1, blk 17, Port Isabell Irr. Co. Subd, dr 7830 ft. Coyle-Concord Oil Co.'s Powell 3-B, I&GN sur, prep to sp. Humble's Relow Land Co. 1, Jos. L. Duggan sur, in sh at 3758, sd to repair rig.

GOLIAD COUNTY—oGliad Oil Co.'s S. E. Cole 1, Range 4, lot 33, Goliad Town Grant, comp through dr pipe est 20 mcf gas 3250 lbs wp ½ in ch, td 5544 ft.

HIDALGO COUNTY—Dayle L. Smith Oil Co.'s Fairbanks & Young 1, por 46, sd 2350 ft.

JACKSON COUNTY—Cockburn Oil & T. Hargrove's Santa Theresa Farms 1, I&GN sur, mi.

JIM WELLS COUNTY—John Camp Prod. Co.'s J. W. Bird 1, Los Presenos de Abajo gr, dr 5140 ft; W. E. Pope 2-B, sec 13, dr below sur csg. Magnolia Pet. Co. et al's A. A. Seeligson 7, Los Jaboncillos sur, dr brittle sh 3400 ft. Premont Royalty Co.'s H. Fealy 1, sec 72, showed sw 2250 and 2350 ft, dr ahead at 2380 ft. Smith Drlg. Co.'s W. D. Wade 1, lot 1, blk "B", dr 5725 ft. Tsesmelis & Reese's Martha Earhart 1, John Suggs sur, ru and conditioning hole to run side wall samples, td 4005 ft. Wellington Oil Co.'s Clara Driscoll Sevier 1, La Anima Sola gr, ab 545, dr 5020 ft.

KARNES COUNTY—DeGraffe & Reele's Cochran 1, McConnell League, sd at 1307 ft.

LIVE OAK COUNTY—R. A. David's John & J. P. Marbach 1, Stephen Hays sur, coring oil and gas show 873-880 ft, upper Pettus had slight oil show, td 880 ft. R. H. Feltner et al's Sanger Ranch 2, GC&SF sur, coring for Cole

sand, td 1948 ft. Loma Oil Co.'s L. Jacob Corp. 8-B, GH&H sur, lcn; C. L. Terrell 1, J. Houghihan sur, sd working on titles, td 53 ft. F. D. Salter et al's I. W. Griffith 2, J. D. Osborn sur, fshg at 924 ft.

NUECES COUNTY — Mills Bennett Prod. Co.'s William Heuermann 1, C. Land sur, dk. Clarkwood Oil Co.'s H. B. Baldwin 1, Russell Farm Lots, abnd 7040 ft. Fain Gillock et al's Robt. Poenisch 1, lot 11, section 32, Flour Bluff and Encinal Gardens, ru. W. L. Hinds' Lucy Rivers 1, sec 301, Bishop subd, dr 1000 ft. Navarro Oil Co.'s E. M. Poenisch 1, lot 21, blk 41, Flour Bluff and Encinal Garden, mim. Phillips Pet. Co.'s John Harney 1, sh 11, Harney lands, coring 5622 ft. Seaboard Oil Corp.'s James P. Luby 1, sec 2, Luby sub, ran dst of sand 5028-47 ft, rec 5 joints high gr oil 500 lbs pres 12 min, cored ahead to 5057 ft, still in sand, ran dst 5043-57 ft 10 min through ⅜ in and ¼ in ch, 175 lbs working press, tool closed made several heads plo, rec 420 ft 44.96 gr oil 1800 lbs btm hole press, coring ahead, td 5057 ft. Shell's State of Texas 1, Laguna Madre Bay, piling driven and sd. Southern Minerals Corp.'s Richard King 1, sec 32, King Farm lots, dr stem stuck 6515 ft. Taylor Pet. Co.'s J. V. Styles 1, sec 18, I. Z. Bishop subd, coring 5307 ft. United Prod. Corp.'s W. H. Harvey 1, Garcia sur, perf higher in 7380 ft sand and prep to make prod. test, td 9002 ft.

REFUGIO COUNTY—Chew & McIntyre's Willia & Emma Daman 1, sec 15, Bonnie View subd, lcn for 6500 ft test. United Prod. Co.'s J. J. O'Brien 12, Refugio field, set 7 in csg 8342 ft, sd at 8357 ft.

SAN PATRICIO COUNTY—Conroe Drilling Co.'s F. L. Foley 1, C. F. Delmas sur, dr 3490 ft. Danrey Oil Co.'s Jean Davis 1-A, Wm. Boyd sur. ru. Eleanor Oil Co.'s J. F. Green Est. 1, T. T. Williamson sur, prep to wash down hole and set 5½ in csg at about 6800 ft, now ru. td 7305 ft. Humble's John S. McCampbell 1, R. Martinez sur, lcn. Phillips Pet. Co.'s B. E. Ivey 1, sec K, reaming at 5100 ft, td 5169 ft.

VICTORIA COUNTY — Transwestern Oil Co.'s A. M. McFaddin 3, J. Varin sur, coring 5186 ft.

WILLACY COUNTY—Ruez-Morton, Inc.'s Fraicisco Armendiaz 1, San Juan de Carricitos gr, drk up; Johnson-Stillman 1, sh 44, San Juan de Carricitos gr, completed 4 mile water line—prepare drill out plugs. Shell's Yturria Land & C. Co. 1, sh 64, San Juan de Carricitos gr, coring sand and sh—no oil show, td 10015 ft.

LAREDO DISTRICT

DUVAL COUNTY—Government Wells Oil Co., Inc.'s H. A. Lundell 1, sec 140, sp. Hiawatha O&G Co.'s Southland Life 2, sec 15, Ball Ranch subd, recompleted as gasser, tp 300 lbs, cp 750 lbs, ¼ in ch, td 5939 ft. Humble's Roos Brothers 1, sur 119, complete pumped 10.4 bbls per hour on potential test, td 2871 ft. Kepley Prod. Co.'s Sevier 2, sec 71, Rafeal Rosalia gr, dr 1850 ft. King Drlg. Co.'s Parr 1, San Andres gr, ru. Magnolia's F. Weil et al 1, sur 565, ru. George Parr Oil Co.'s Puig 1, San Andres gr, flowing estimated 10 barrels per hr, ¼ choke. Penn-Palangana Oil Co. et al's C. K. Gravis 1, sec 254, dr 4220 ft. Reynolds & Richardson's D. Ruiz Est. 2, C&M Ry. sur No. 125, dr plugs 2649 ft. Reynosa Oil Co. et al's F. G. Wilson 1, blk 9, Sweden subd, cleaning into pits, td 4775 ft. Russ Pet. Corp. et al's A. Farias 1, Santos Flores gr, flowed 92.78 bbls in 18 hrs ⅛ in ch, cp 780 lbs, tp 700 lbs. (19 ft lower than Gravis), td 4804 ft. Standard of Kansas' Rossi 1, blk 10, Sweden subd, lcn. Trahan & Tuttle's J. C. Megerle 1, sur 245, sd 900 ft. George V. Viteri et al's Cadena 1, blk 6, G. Stewart O&G sub, dr 5626 ft. W. H. Wollett and M. D. Masten"s Bishop Cattle Co. 2, sur 74, lcn.

JIM HOGG COUNTY—T. O. Shappell Oil Co.'s Thompson 1, sh 2, blk 2, Las Animas gr, Thompson subd, abnd 1325 ft.

McMULLEN COUNTY—Harrison & Danvers' J. A. Jungman 1, M. Hely sur, abnd 1100 ft. Harvey & Henderson's Nueces Land & Livestock Co. 1, sec 105, wor. W. L. Hinds' Douglas W. Rhodes 1, H. Nadler sur, set sur csg, woc. W. P. Howard's B. C. Claunch 8, M. Hely sur, fsg 1120 ft. Howell Oil Co.'s J. H. Martin Hrs. 1, sur 213, dr 2650 ft. Edwin M. Jones' Harry Ezzell 4, H. Russell sur, No. 12, flowing 10 bbls per hr ¼ in ch, tp 85 lbs, cp 325 lbs. td 1534 ft. Edwin M. Jones' Ezzell 5, H. M. Brewer sur No. 7, lcn; Ezzell 6, C. O. Ragland sur, wor, wtr well completed. J. T. Lanier's E. R. Hagist 1, sur 481, dr 1145 ft.

STARR COUNTY — Calderoni's-James'-Follette's Francisco Rodriguez 1, por 80, J. of Camargo, sd at 150 ft. Carter & Stiernberg's Quirino Vela 1, por 85, Tangue Ranch subd, set 8 in csg at 100 ft. John H. Clopton et al's Dionicio Tijerina 4, blk 12, sh 14-C, por 80, J. of Camargo, sd for heavier rig, td 1530 ft. Cook, Maris, Arnold's Starr County Cattle Co. 2, Cook, Maris, Arnold Subd, sd below 2200 ft. W. F. Dolgener et al's Y. Garcia de Garcia 1, sh 7-B, por 71, J of Mier, no report, td 402 ft. K. E. Merren's Starr County Cattle Co. 1-A, por 89, blk 34 of Jefferies & Lambeth sub, dr plugs at 5417 ft. Henry Mode et al's Kelsey Bass 1, por 87, sh 7, sd 1100 ft. Moss & Heard's S. B. Ricaby 4, por 83, ru. F. P. Schwab & Fred Foster's Antioco Munoz et al 1, Javali grant, ran electric formation tester, D&A, td 2309 ft. Transwestern Oil Co. et al's T. B. Slick Est 2, sec 527, pb, td 4900 ft, woc, td 5659 ft.

WEBB COUNTY—Mills Bennett Prod Co.'s M. D. Slator 3, blk 72, Slator subd, lcn. Bolling & Coffey's A. Villareal 1, sur 768, dr 2085 ft, top Rosenburg 1975 ft, slight gas show. C. C. Bonner et al's Cuellar Bros. 1, sh 4, dr 1225 ft. Dolores Oil Co.'s Emma Adami 1, sur 15, dr 1000 ft. Eugene Garner, Jr.'s R. Saldivar 2, sur 657, testing after recementing, td 1000 ft.

ZAPATA COUNTY—Allison & Abrams' S. Vela 1, sur 259, ru. H. Q. Lewis' S. Benavides 1, blk 39, Fansler & O'Hern sub, coring 2127 ft. Ray L. Martin's S. Vela 1, blk 44, sh 2, lcn. Ray L. Martin's S. Vela 1, blk 77, sh 4, lcn. J. O. Sheffield's C. H. Buck 1, sur 273, dr 50 ft. Westheimer & Daube's E. Lopez 1, blk 7, sur 288, abnd 2100 ft.

TEXAS GULF COAST

AUSTIN COUNTY—Cockburn & Hargrove's Forester 1, New Ulm area, A. J. Bell sur, abn 3850 ft.

BRAZORIA COUNTY — Pure's Slade 1, Peach Point prospect, S. F. Austin sur, abstract 20.

COLORADO COUNTY — Humble's Relaw Land Co. 1, Eagle Lake area, L. Duggat sur, dr shale 4908 ft.

FORT BEND COUNTY—John Byer's Lockwood Sharp 1, Wm. McMahon sur, dr shale 3106 ft, washing 7842 ft.

HARRIS COUNTY — H. J. De Arman's Tyrell & Garth 1, Cedar Bayou prospect, L. Hemingway sur, abn 7029 ft. Stanolind's Oates 1, Clinton area, C. Martinez sur, cutting and pulling screen 8095 ft. Texas Gulf Prod. Co.'s Gillespie 1, Aldine area, S. Contreras sur, sd 7100 ft. Superior's Butler 1, Bammel area, J. Ehrhardt sur, dr shale 7595 ft.

JEFFERSON COUNTY—Magnolia's Phelan 1, sw of Amelia in Cheek area, S. Stivers sur, waiting on casing at 8478 ft.

LIBERTY COUNTY—Jack Frazier's Hanchey 1, Hardin area, H. B. Johnson sur, dr shale 5021 ft.

MATAGORDA COUNTY — Continental's Hawkins 2, Sheppards Mott, D. McCarthy sur, dr shale 4905 ft. Sun's Craig 2, Hawkinsville area, J. Williams sur, dr shale 5941 ft. United North & South Development Co. (Receivers), Stoddard 1, sw of Buckeye, Cotton sur, testing 9945 ft.

SAN JACINTO COUNTY—Cockburn et al's Whitten Estate 1, Keno area, Wm. West sur, spudded.

MONTANA

PONDERA COUNTY—Gordon Campbell et al's Hughes 1, ne ne nw 12-30n-4w, abd 2585 ft. Kirk Oil Co.'s Kellog 1, se nw ne 31-28n-4w, dr 2296 ft. Klinch Petroleum Co.'s Hollam 1, nw ne nw 12-28n-6w, dr 2785 ft.

YELLOWSTONE COUNTY—Broadview Oil Co.'s Halbritter-Stoltenberg 1, se ne 18-3n-22e, dr 279 ft.

WYOMING

CONVERSE COUNTY—
Chadron Osage Oil Co.'s State 1, sw sw 16-32n-69w, dr 3525 ft. Wyoming Southern Oil Co.'s Jennie Everett 1, nwc sw 26-32n-69w, running 8 in csg to 495 ft preparatory to completing for shallow gas well.

PARK COUNTY — General Pet. Corp.'s Government 1, nw nw nw 33-47n-100w, milling on iron in hole and co to lower another shot to test production in the Tensleep formation at 5903-5996 ft.

UTAH

EMERY COUNTY — Continental & California's Unit-1 2, nw nw 27-23s-11e, dr 4545 ft.

GRAND COUNTY—Cane Creek Oil Co.'s Government 1, nw sw 31-26s-21e, rur.

NEBRASKA

DAWES COUNTY — Stephens Pet. Co.'s Palmer 1, nw sw 10-35n-50w, dr 2463 ft.

JEFFERSON COUNTY—L. R. Page et al's Bonham 1, cse se 1-1n-1e, mit.

SIOUX COUNTY—J. M. Huber Corporation's Morgan 1, csw sw 32-35n-56w, cemented cave and co to dr ahead 2900 ft.

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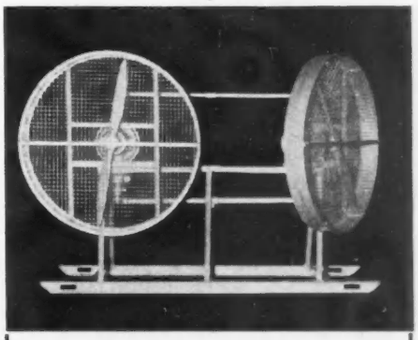

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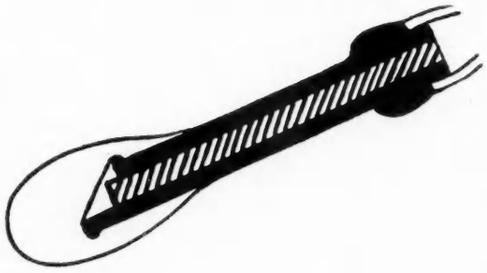

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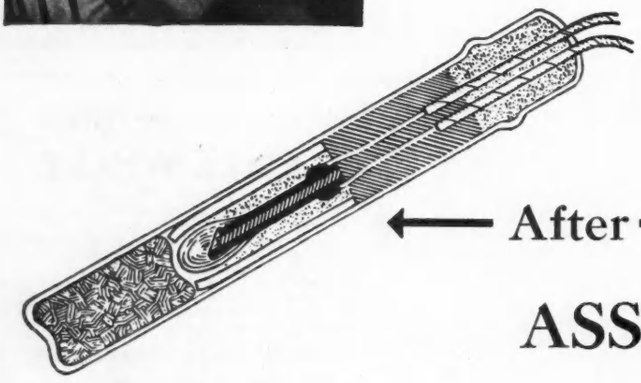

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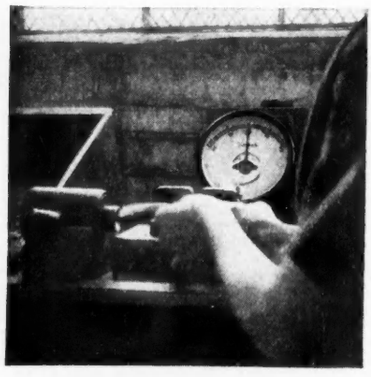

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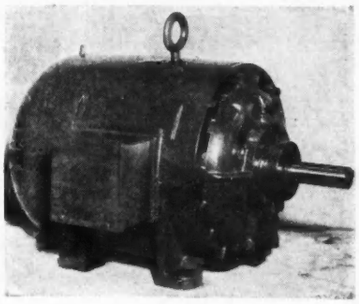
The motor frame contains two separate sets of air ducts, one set internal and one set external. The internal ducts are open in the interior part of the motor and the external ducts are open on the outside of the motor frame. These two sets of ducts are separated by a common wall.



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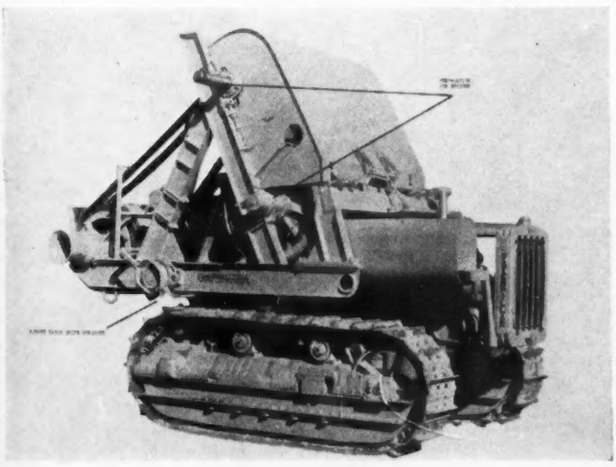
The heat exchanger principle is used for cooling. An internal fan on the rotor circulates warm internal air through the internal ducts, the walls of which are cooled by the external fan blowing larger volumes of cool air through the external ducts, providing rapid transfer of heat from the motor, insuring long insulation life.

The housing is designed so that fresh grease enters the outside edge at the top of the bearing and excess or used grease is discharged at the bottom inner edge to the overflow sump. Since adding fresh grease automatically cleans the used grease from the bearing, it is unnecessary to incur the expense of periodically dismantling the motor to clean the bearings. The used or excess grease may be readily removed from the overflow sump through a pipe plug opening. The cartridge type bearings are fully protected when the rotor is removed.

DOUBLE-DRUM DRAW WORKS
All-Steel Products Manufacturing Company

All-Steel Products Manufacturing Company, Wichita, Kansas, has announced a new double-drum draw works, single-drum draw works or cable tool drilling unit all in one piece and mounted on Diesel or gasoline crawler tractor.

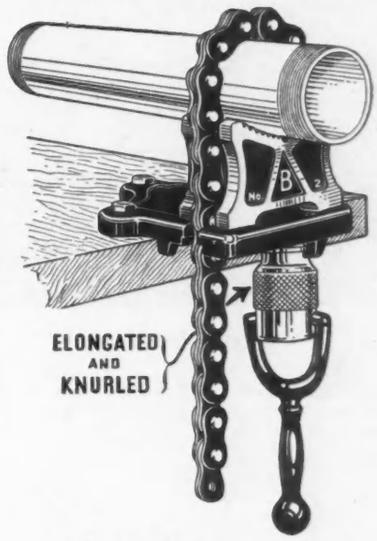
The unit provides a mobile drilling or well-servicing machine for use where there are no roads or where it is impossible to use trucks. The tractor may also be used to move other tools or skid derricks. This tractor-mounted draw works and cable-tool drilling unit fills the demand for a unit that can be used for servicing or drilling to 3500 feet. Pulling casing can be accomplished with this unit for any depth wells.



Allsteel Drawworks

CHAIN PIPE VISE
The Billings & Spencer Company

The Billings & Spencer Company, Hartford, Conn., announces a new chain pipe vise embodying a new construction feature, the heavily knurled and elongated adjustment nut which enables the slack in the chain to be taken up more rapidly. A partial turn of the handle is sufficient to clamp the pipe. The improved vise is made entirely of steel. Base, handle and jaws are drop forged, the jaws from special analysis tempered steel, heat-treated. Chains are heavy for rugged work. Though the vise is light the drop-forged construction insures maximum strength. The vise is made in four sizes with capacities from ⅛ to 8-inch pipe.



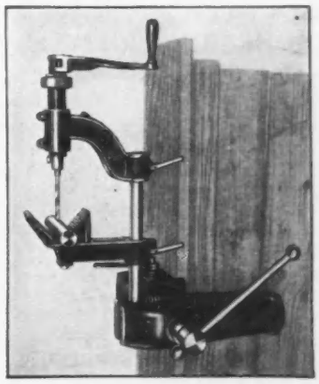
Billings & Spencer Pipe Vice

HEAVY-DUTY PORTABLE DRILL
The Lisle Corporation

The Lisle Corporation, Clarinda, Iowa, announce a heavy-duty portable drill.

The V-Block can be removed and the work arm used as a clamping arm to attach drill to the surface through which a hole is to be drilled. The work arm can be used as a foot in connection with a chain over the drill arm and around the work or with the drill arm reversed on the bar for drilling in a direction away from the work arm.

Both the work arm and the drill head can be clamped on the bar. The ratchet handle makes it possible to drill in close quarters. Ball-thrust bearings in the spindle take the drilling load. Renewable bronze bushings center the spindle. There is a provision for takeup at all points of wear. The feed is semi-automatic under control of a feed clutch which can be engaged or disengaged from the movement of the handle. In addition to drilling, the unit can be used as a



Lisle Portable Drill

clamp or forcing press. Standard drilling radius is 6 inches. An extension work arm is available to increase this radius to 16 inches.

The drill itself consists of a 1⅛-inch bar. The drill head complete with spindle arm, hand feed and ratchet handle and clutch for power feed works in conjunction with the clamping arm and is adaptable to many different positions. It is fitted ordinarily with ½-inch Prentice or blacksmith type chuck and is available with a No. 2 Morse taper chuck and also with a No. 34 Almond 3-jaw chuck. It is especially recommended for quick repair service wherever a breakdown occurs.

WELDING ELECTRODE

The Lincoln Electric Company

The Lincoln Electric Company, Cleveland, Ohio, announces a new electrode which eliminates necessity of multiple pass welding in production of fillet and lap welds in many applications, and which permits production of such welds without undercutting or overlap. Fillet welds up to ⅜-inch in size with one plate vertical, can be produced in one pass with the electrode. The welds show no undercutting at the vertical plate and no overlap at the horizontal plate.

New Lincoln Electrode Aid in Welding Process

Fillet welds of any size can be made more easily, of better quality and at higher speed with the electrode than was heretofore possible, the company claims. The advantages will be apparent in all applications for fillet welding including tank, shipbuilding, bridge and building construction, fabrication and manufacture.

The new electrode, designated as "Fleetweld 8," is the result of considerable research and experiment to develop an electrode which would simplify fillet welding and improve its quality and economy.

The new electrode is heavily coated for welding by the shielded arc process. The welds produced are smooth and dense with notably high physical properties. The tensile strength of the weld metal as deposited is 68,000 to 72,000 pounds per square inch. Ductility is 20 to 30 percent elongated in 2 inches as deposited, and 30 to 36 percent stress relieved. Other properties including resistance to fatigue, impact and corrosion are equal to or better than mild steel.

"Fleetweld 8" comes in 14 and 18-inch lengths. The 14-inch lengths are made in ⅜, 5/16, ¼, 3/16 and 5/32-inch sizes while the 18-inch lengths come only in the ⅜, 5/16 and ¼-inch sizes.

BALL-BEARING JOURNAL JACKS

Templeton, Kenly & Company

Templeton, Kenly & Company, Chicago, announce a new Simplex Ball Bearing Journal Jack, low height but high in capacity and efficiency.

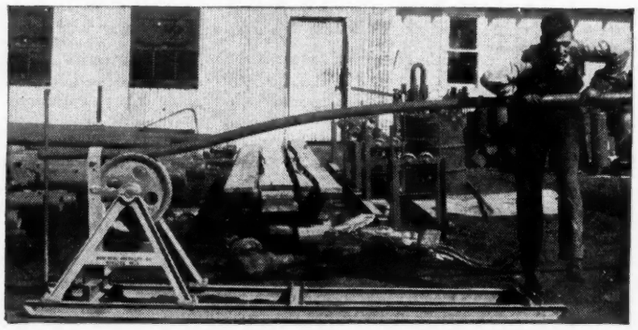
Modern design, heat-treated alloy steel forgings, special bronze nuts, ball bearings and greater gear ratio jacks, are produced in these powerful, light, simple, and strong jacks. They are constructed in capacities of 15, 25, 35 and 50 tons. Each jack is 10 inches high when closed, and has a lift of 5 inches.

Simplex Jack

PIPE STRAIGHTENER

New Deal Specialty Company

New Deal Specialty Company, Okmulgee, Oklahoma, has added another "pocket size" model to its line of Sturdi-Bilt series of pipe cleaning machines and pipe straightening machines. This new machine is the Rolley Polley model pipe straightener for small pipe and conduit up to 2-inch.



New Deal Pipe Straightener

The machine is only 37 inches high, 24 inches wide and 10 feet long. It weighs only 350 pounds and is sturdy in construction, fast acting and economical in operation. It is a hand operated, roller type machine that fits all needs for small pipe and conduit quickly. The Rolley Polley is specially designed for boiler house, pipe yard and mobile field use.

REVERSIBLE RATCHET WRENCH

J. H. Williams & Co.

J. H. Williams & Co. has placed on the market a new heavy duty reversible ratchet wrench employing a new type of construction. Quadruple pawls provide increased bearing and strength by two pawls engaging two teeth for both "on" and "off" rotation of nuts. All four pawls are hardened tool steel, designed to provide pure crushing action on the

Williams Wrench

pawls. The handle or wrench proper is made of drop forged steel. Both hex and square sockets are used with this wrench with 20 instead of the usual 16 teeth in the socket gears. The wrench will rotate with only an 18 degree swing. The wrench may be used with any length bolt. Sockets are held in place by a simple retaining collar.

As an illustration of the strength of this new wrench, 15 men, representing a total weight of 2,052 pounds are shown suspended from the extreme end of this new type heavy duty reversible ratchet wrench.

This Week with the Industry's EQUIPMENT SUPPLIERS

H. John Eastman on European Tour

H. John Eastman, president of Eastman Oil Well Survey Company, left New York June 1 for Paris, France, where he will deliver a paper before the Second World Petroleum Congress. While in Europe he will visit Germany, Roumania, England, Russia, and the Hague in the interest of his company. He is accompanied by his daughter, Frances.

T. E. Sutter to Attend World Petroleum Congress in Paris

T. E. Sutter, vice president and general manager of Baker Oil Tools, Inc., Huntington Park, California, sailed June 2 to attend the World Petroleum Congress in Paris, France.

In addition to attending the sessions of the Congress, Sutter's itinerary includes visiting The Hague, points in Germany, Switzerland and the British Isles. He will contact various foreign representatives and customers of the company. He is expected to return to the United States the latter part of August.

T. E. SUTTER
Enroute Europe

Earl M. Rees Making World Tour

Earl M. Rees, sales manager of Fluid Packed Pump Company, Los Nietos, California, left Los Angeles May 27 for New York, where he sailed for England on June 4 aboard the S. S. Statendam. He will visit oil company headquarters in London and The Hague and will stop over in Paris to attend the World Petroleum Congress in June. From Europe, he will proceed to the East Indies for a tour of the principal oil fields, returning to Los Angeles late in September.

International Supply Opens Dallas Office

International Supply Company, Fort Worth, has opened an office at Dallas, Texas. The office is located at 1121 Liberty Bank Building, under the direction of Hayes O. Trego, district manager. R. L. Neal is district manager of the recently opened Wichita, Kansas office at 507 Bitting Building.

Cutler-Hammer Opens Dallas Office

Cutler-Hammer, Inc., Milwaukee, has opened a new sales office in Dallas, Texas, located at 624 Santa Fe Building. A stock of standard apparatus will be carried in Dallas.

H. C. Eddy Visiting Houston Branch of Petroleum Rectifying

H. C. Eddy, chief engineer of Petroleum Rectifying Company of California, Los Angeles, is at the company's Houston branch for extended conferences with the staff there on various new designs and engineering features of the company's equipment. He also is reviewing the accomplishments and future program of the Houston laboratory and will coordinate its work with that of the company's laboratory at Long Beach, California.

Consolidated Crane Company Sales Departments Consolidated

P. R. Mork, vice president in charge of sales, Crane Company, Chicago, announces the co-ordination of all activities concerned with the estimating, engineering, or sales of valves, fittings, pipe, and fabricated piping into one unit, the valve and fitting department, with W. H. Pape as manager. Pape enters his new position with 25 years' experience covering a wide range of industrial applications of Crane products. His first activity was in heavy railroad construction followed by similar work on New York subways. In 1914 he entered the oil industry serving subsequently as designer, operator, and sales engineer. He joined Crane Company in 1927 as special representative in New York and later in the Boston territory. For 6 years he was in the Oklahoma and Gulf Coast oil fields, and for the past 1½ years has been manager of the oil sales department in the general office, Chicago.

The former industrial sales department and engineering sales department are consolidated into a new section—the engineering sales section of the valve and fitting department with E. Burke as manager. G. F. Wright, assistant manager in charge of estimating and other activities dealing with fabricated pipe and allied products, and W. F. Lahl, assistant manager, supervising the industrial zone men in the field. J. H. Barker is manager of the sales quotation section of the valve and fitting department. Other sections of the new consolidated department include pipe sales, marine sales, oil sales, railroad sales, and water works sales.

W. HOWARD RAPE

Johnston Oil Field Service Opens Houston Office

Johnson Oil Field Service Corporation announces the opening of executive offices at Suite 844, First National Bank Building, Houston, Texas. The manufacturing plant and main service depot is located at 131 Harvard Street, and branch field operating points are maintained at central working points throughout the active oil areas.

Southwest Equipment Company Opens Tulsa Office

Southwest Equipment Company, Dallas, Texas, has opened a sales office and warehouse at 224 North Boulder Avenue, Tulsa. Stocks of Case oil field engines and repair parts will be kept in Tulsa, Oklahoma City and Wichita, Kansas. Philip Cline, transferred from the Kilgore store in East Texas, will have charge of the Tulsa branch.

J. P. Boore With Babcock & Wilcox Tube Company

The Babcock & Wilcox Tube Company, Beaver Falls, Pa., announces appointment of J. P. Boore, effective May 15, as assistant general sales manager. Boore has had broad experience in the production and merchandising of seamless steel tubes and pipe. For several years he was vice president of Summerill Tubing Company, and for 20 years prior to that he was associated with Pittsburgh Steel Company in various capacities in the production and sales departments.

C. C. Jordan Promoted by Allis-Chalmers Manufacturing Co.

C. C. Jordan, sales engineer for the past 10 years in the steam turbine division of Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, has been appointed assistant manager of that division.

Graduating from Purdue University in 1923 in mechanical engineering, Jordan began by way of the company's graduate student course, advancing into the steam turbine division where for a number of years he did field testing, handling trouble work and sales estimating, prior to his long service as sales engineer.

Squeaks from the Bull Wheel

Safety First

Greatly agitated, a woman carrying an infant dashed into a drug store.

"My baby has swallowed a bullet!" she cried. "What shall I do?"

"Give him the contents of this bottle of castor oil," replied the druggist calmly. "And then be sure you don't point him at anyone!"

Knows His Position

"Funny, ain't it, pa," said Johnny, "that everybody in our house is some kind of an animal?"

"What do you mean?"

"Why, mother's a dear, and baby's a little lamb, and I'm a kid—I can't think what you are pa."

"I'm the goat, my son; I'm the goat."

Effective

Speaker (desirous of raising money): "All who will give $10.00 stand up."

To musician: "Play the 'Star-Spangled Banner.'"

Time and Overtime

"You ought to cut my hair cheaper, there's so little of it."

"Oh, no. In your case we don't charge for cutting the hair, we charge for having to search for it."

Tight

Patient: "My wife objects to my sleeping with my mouth open. What can I do about it?"

Examining Doctor: "Nothing, I am sorry to say. Your skin is too tight; when you close your eyes it pulls your mouth open."

Not so Dumb

Kemmerer: "Why is your car painted blue on one side, and red on the other?"

Hulen: "It's a great scheme. You should hear the witnesses contradict each other."

No Further Interest

"Next to a beautiful woman what do you think is the most interesting thing in the whole world?"

"When I'm next to a beautiful woman I never to stop to consider."

Your Peers

A judge was holding court in a remote rural district. He was listening intently while a prospective juror was questioned by a lawyer in the case.

"Do you know anything about this case?"

"No."

"Have you heard anything about it?"

"No."

"Have you read anything about it?"

"No, I can't read."

"Have you formed any opinion about the case?"

"What case?"

"Accepted."

Correction

A school teacher, after examination of the pupils in her class by the school nurse, wrote the following note to the parents of a certain little boy:

"Your boy, Charles, shows signs of astigmatism. Will you please investigate, and take steps to correct it?"

The next morning she received a reply from the boy's father, who wrote:

"I don't exactly understand what Charles has done, but I have walloped him tonight, and you can wallop him tomorrow. That ought to help some."

Perfectly Happy

She—But can you support me properly?

He—With my salary and your alimony, we'll be sitting on top of the world.

Something Else Again

Sandy had been wooing Jean for some months, and, except that he was a bit economical with his money, she had found him satisfactory.

One day she called on him, and seizing the opportunity he asked, "Are you fond of moving pictures, Jean?"

"Aye!" she said, hopefully.

"Then, lass, maybe ye'll help me tae get hauf-a-dozen doon oot o' the attic."

Plays a Tune on 'Em, Too

Rastus, from Boston, was trying to impress his southern cousin with the speed of northern trains.

"When dat ol' Montreal Express gits to hummin,' Mose," he solemnly asserted, "de telegraph poles look like slats on a chicken fence."

"Humph," sniffed Mose, "when de Pan-American steps out fo' New Orleans, it makes dem mile poses look like a fine-tooth comb."

Seeks Family Reunion

"I could have you put in jail for this."

"If you do send me to Sing Sing, I haven't seen my father in five years."

Mild Criticism

"You were very severe on my play," said the producer. "What was really so bad about it?"

"I didn't like the way you handled your lights," replied the critic.

"What was wrong with them?"

"They were on!"

Satisfactory Results

An Irish soldier in France, during the war of 1914-18, received a letter from his wife, saying there wasn't an able-bodied man left, and she was going to dig the garden herself.

Pat wrote at the begining of his next letter, "Bridget, please don't dig the garden; that's where the guns are."

The letter was duly censored, and in a short time a lorry-load of men in khaki arrived at Pat's house and proceeded to dig the garden from end to end.

Bridget wrote to Pat in desperation, saying that she didn't know what to do, as the soldiers had got the garden dug up, every bit of it.

Pat's reply was short, and to the point:

"Put in the spuds."

Something

"Did any of your ancestors do things to cause posterity to remember them?"

"I reckon they did. My grandfather put mortgages on this place that aren't paid off yet!"

Even Up

Did you notice the wonderful coat the woman had on who was sitting in front of us in church this morning?

No; I'm afraid I was dozing.

It does a lot of good to take you to church, doesn't it?

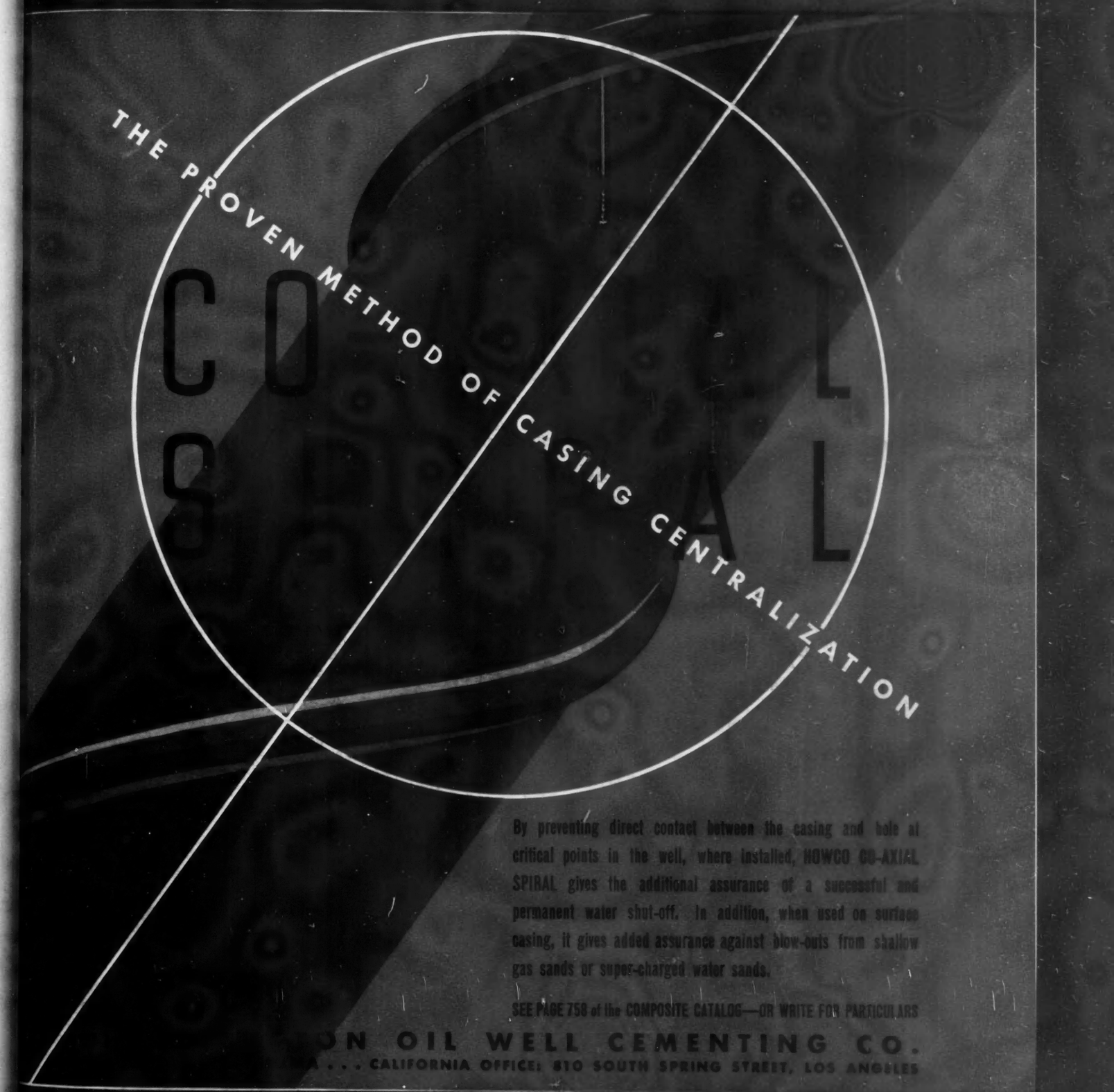
Gotkool
WATER CANS
& COOLERS
GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug fitting large removable top, handy non-leaking push button faucet. GOTT Water Cans for handy field use. Your Supply Store has them, get one today! . . . .
Gott
WATER COOLER
GOTT WATER COOLER
Made in 3, 5, 8, 10, and 20 gallon sizes.
GOTT WATER CAN
Made in 1½, 3, 5, and 10 gallon sizes.
H. P. GOTT MFG. CO.
WINFIELD, KANSAS
KEEP PURE DRINKING WATER ALWAYS HANDY

the OIL WEEKLY

OIL and GAS ENGINEERING

INTERNATIONAL AUTHORITY FOR THE PRODUCING AND PIPE LINE INDUSTRY

THE WEEK'S NEWS INTERPRETED



By preventing direct contact between the casing and hole at critical points in the well, where installed, HOWCO CO-AXIAL SPIRAL gives the additional assurance of a successful and permanent water shut-off. In addition, when used on surface casing, it gives added assurance against blow-outs from shallow gas sands or super-charged water sands.

SEE PAGE 758 of the COMPOSITE CATALOG—OR WRITE FOR PARTICULARS

...ON OIL WELL CEMENTING CO.

...A . . . CALIFORNIA OFFICE: 810 SOUTH SPRING STREET, LOS ANGELES

TRU·LAY *Preformed* ROTARY LINES

FASTER ROUND TRIPS
SPOOLS PERFECTLY
NO CRUSHING ON DRUMS
RESISTS WHIPPING
STRINGS FASTER
EASIER TO THREAD
RESISTS KINKING
HANDLES EASIER
BALANCED STRAND TENSION
NO INTERNAL STRESS
LASTS LONGER
GREATER DOLLAR VALUE

GREEN SIGNIFIES SAFETY

BUY ACCO QUALITY

● Ever since Tru-Lay Preformed Rotary Lines were first introduced, more and more drillers have learned that for greater production—fewer interruptions to drilling—and faster, easier operation—Tru-Lay Preformed is the answer. The big operators who keep accurate records of rotary line service and expense have known this for a long time. But whether for a big or small operator—Tru-Lay Preformed *everywhere* shows its superiority. Specify it for your next line.

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE COMPANY, Inc.
WILKES-BARRE, PENNSYLVANIA
Branches or Distributors in All Oil Field Centers

In Business for Your Safety

A FEW OF THE 137 AMERICAN CHAIN & CABLE INDUSTRIAL PRODUCTS

AMERICAN CHAIN DIVISION
(DOMINION CHAIN COMPANY, Ltd., in Canada)
Weed Tire Chains • Welded and Weldless Chain • Malleable Castings • Railroad Specialties

AMERICAN CABLE DIVISION
Tru-Lay Preformed Wire Rope • Tru-Loc Processed Fittings • Crescent Brand Wire Rope Tru-Stop Brakes

ANDREW C. CAMPBELL DIVISION
Abrasive Cutting Machines • Floformers Special Machinery • Nibbling Machines

FORD CHAIN BLOCK DIVISION
Chain Hoists • Trolleys

HIGHLAND IRON & STEEL DIVISION
Wrought Iron Bars and Shapes

MANLEY MANUFACTURING DIVISION
Automotive Service Station Equipment

OWEN SILENT SPRING COMPANY, Inc.
Owen Cushion and Mattress Spring Centers

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READING-PRATT & CADY DIVISION
Valves • Electric Steel Fittings

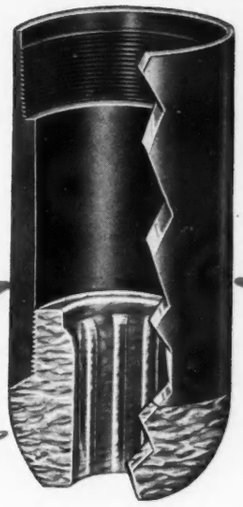
READING STEEL CASTING DIVISION
Electric Steel Castings, Rough or Machined

WRIGHT MANUFACTURING DIVISION
Chain Hoists Electric Hoists and Cranes

TRU·LAY *Preformed* ROTARY LINES

ALL AMERICAN CABLE DIVISION ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

"Bakelite is the Perfect Material for Guide Shoes!"



FABRIC BAKELITE is a shock-resistant material which is particularly adaptable to Guide Shoes, as it cannot be fractured or broken by collision or contact with obstruction in the hole.

In fact, Bakelite is *stronger* and *tougher* than any other material which could be used for this purpose. Larkin Bakelite Guide Shoes, under actual compressive test, withstood 49% greater pressure than concrete guides.

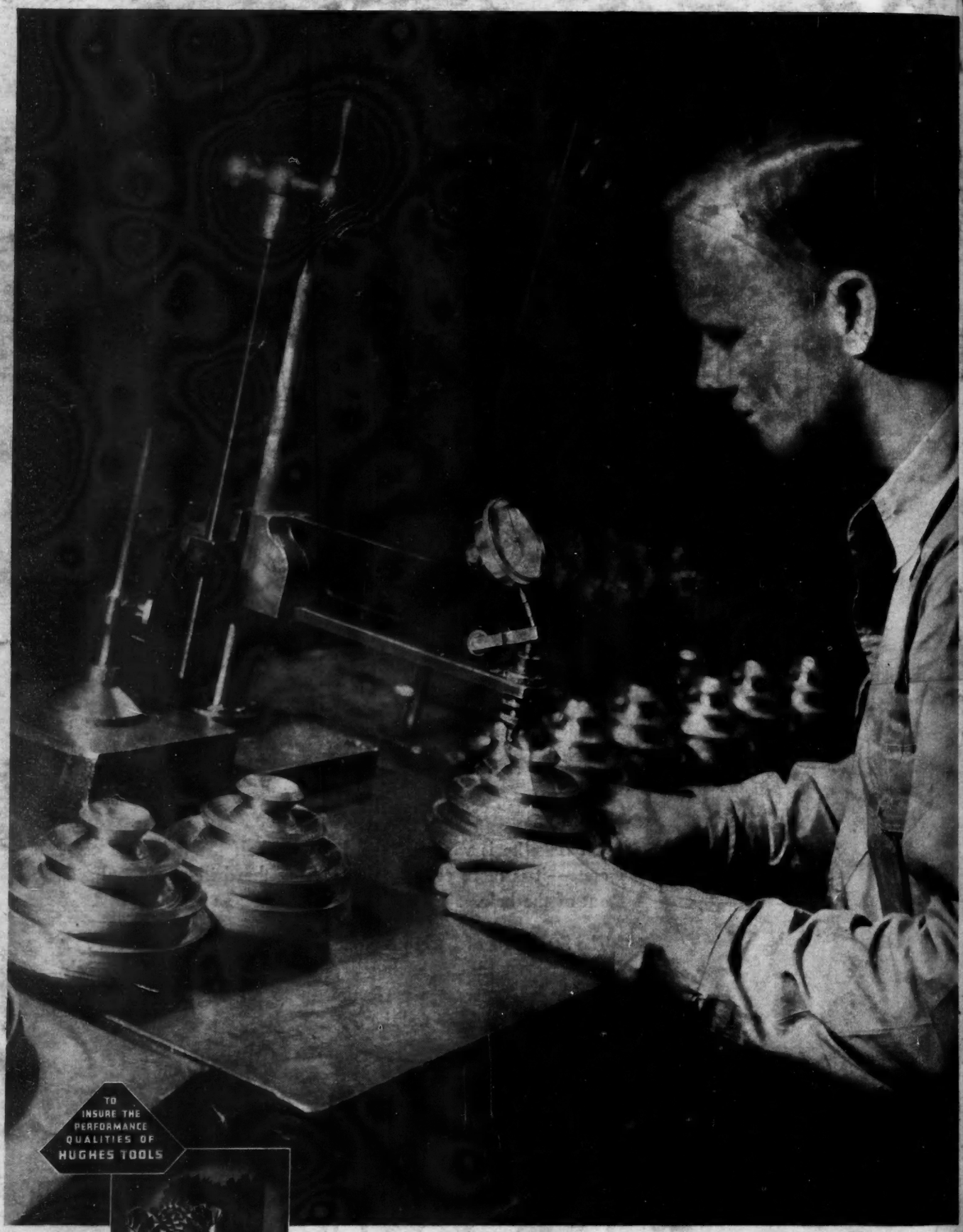
Yet Bakelite is very *light*—it has only half the weight of concrete—it is more easily pulverized by the drill and circulated out of the hole.

The Steel part of Larkin Bakelite Guide Shoes is made from .60 carbon steel billets, having 77,000 lbs. tensile strength. Hob cut threads guarantee perfection as to pitch and taper. Each shoe is bevelled for welding.

From the standpoint of 100% efficient performance—specify Larkin Bakelite Guide Shoes.

LARKIN PACKER CO., ST. LOUIS, U. S. A.

LARKIN PACKER CO.



TO INSURE THE PERFORMANCE QUALITIES OF HUGHES TOOLS

Inspecting height and accuracy of grooves of Hughes Self-Cleaning Cones prior to milling teeth

HUGHES TOOL COMPANY, HOUSTON, TEXAS, U.S.A.